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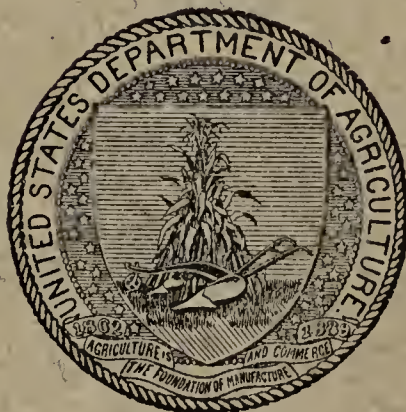
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A MANUAL
OF
DANGEROUS INSECTS
LIKELY TO BE INTRODUCED IN THE
UNITED STATES THROUGH
IMPORTATIONS.

EDITED BY

W. DWIGHT PIERCE,

Entomologist, Southern Field Crop Insect Investigations.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.

1917



DIFFERENT STAGES OF THE GIPSY MOTH (*PORHETRIA DISPAR*).

Egg mass on center of twig; female moth ovipositing just below: female moth below, at left, enlarged: male moth, somewhat reduced, immediately above: female moth immediately above, somewhat reduced: male moth with wings folded in upper left: male chrysalis at right of this: female chrysalis again at right; larva at center. (Howard and Fiske.)

Issued Aug. 15, 1917.

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OFFICE OF THE SECRETARY.

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A MANUAL OF DANGEROUS INSECTS LIKELY TO BE INTRODUCED IN THE UNITED STATES THROUGH IMPORTATIONS.

This publication has been prepared in the Bureau of Entomology at the request of and in cooperation with the Federal Horticultural Board to supply such information as is required by its officers and others in the enforcement of quarantines and the safeguarding of this country against foreign insect pests. It should assist materially in preventing the introduction of additional pests like the gipsy moth, boll weevil, and alfalfa weevil. Only a brief sketch can be given of each of the more important species. The plants making up the commerce in vegetable products are arranged alphabetically by the American common name, with the scientific name following. It is believed that this arrangement is most convenient for inspectors. A brief sketch of certain important facts concerning each plant is also given.

The arrangement under each plant of the insects in two or more categories, A, B, etc., is merely one of convenience. Under A are grouped the better known insects, or those concerning which there is available literature. This category especially contains pests which are easily imported. Under B are listed many important pests, possibly sometimes more important than those listed in A and often just as readily introduced. They are merely listed because full descriptive matter was not available and for other similar reasons. In later editions probably many of these pests will merit fuller discussion.

It is not to be expected that inspectors will attempt to make final determinations with the aid of this work. In fact, it would be very unwise to do so. The book is merely to indicate to inspectors and entomologists the insects likely to be found associated with importations.

The references to foreign literature under the species give the best or most easily available source of additional information. Tables and keys to species could not possibly be included in a work of this kind. It is expected that the inspector, on finding important insects not already familiar to him, will immediately transmit specimens to the Bureau of Entomology at Washington, D. C., for reference to the proper authorities or to other competent specialists in the groups to which the insects belong.

This compilation was only possible by the cooperation of all the divisions of the Bureau of Entomology, some of which prepared the matter in the form in which it now appears. The editor therefore wishes to acknowledge the assistance of Messrs. C. L. Marlatt, W. D. Hunter, A. D. Hopkins, the late F. M. Webster, F. H. Chittenden, A. L. Quaintance, W. R. Walton, E. R. Sasser, Jacob Kotinsky, Dwight Isely, H. L. Sanford, and R. W. Rust for the collection of the notes on the insect enemies of the crops investigated by them, and of Messrs. W. R. Walton, Harry B. Bradford, and the late J. F. Strauss in the preparation of the illustrations.

The lists of insects included in this manual are necessarily incomplete, and no doubt important species have been omitted. Frequently the literature on dangerous species is so meager as to make it impossible to conclude as to the importance of the species.

Regarding the nomenclature, it should be remembered that this work is strictly a compilation. Many of the names will undoubtedly be changed as the result of future studies. The ones used, however, are the ones current in European literature. To have attempted to make the nomenclature more exact would have involved practically the revision of many large groups of insects. This would have been entirely impracticable and would have delayed publication of the manual for years. Moreover it would have resulted in a publication which inspectors would have had difficulty in using on account of the fact that the literature accessible to them would have, in many cases, used other names. In order to make future editions of this handbook more useful, the bureau will be greatly obliged for criticism, additions, and recommendations as to treatment.

The majority of the insect pests in the United States which now occasion the greatest damage to orchard, field, and garden crops and to stored products and in homes, etc., are of foreign origin, and were introduced with the host plants or accidentally in the course of commerce. Such introductions of new pests are going on all the time, as illustrated by such recent arrivals as the Argentine ant in New Orleans and the alfalfa leaf weevil in Utah. The list of over 100 introduced insect pests given below illustrates the nature of the most important of these introductions in the past. This handbook contains the names of hundreds of other insects which now occur in different parts of the world and which are liable to be introduced at any time with nursery stock or in merchandise or as accidental guests or stowaways on ships or in baggage. It also includes a considerable number of introduced pests which are not now generally distributed and which therefore should be guarded against both as to further entry and to further distribution within the United States.

Throughout the work species which have been introduced into the United States are marked with an asterisk (*) and the fact of the

introduction is mentioned. Many of the most important introduced insects are omitted because they are now so generally distributed that the importation of a few additional individuals will have no effect upon the existing economic conditions.

LIST OF IMPORTANT FOREIGN INSECTS WHICH HAVE BEEN INTRODUCED INTO THE UNITED STATES.

MITES (ACARINA).

- Orange rust mite or lemon mite. *Eriophyes oleivorus* Ashmead. (See Citrus.)
 Grape blister mite. *Eriophyes vitis* Landois. (See Grape.)
 Pear leaf blister mite. *Eriophyes pyri* Pagenstaecker. (See Pear.)
 Plum blister mites. *Eriophyes phlæocoptes* Nalepa and *E. padi* Nalepa. (See Plum.)
 Potato root mite. *Rhizoglyphus* (*Ccepophagus*) *echinopus* Fumouze and Robin. (See Potato.)

THRIPS (THYSANOPTERA).

- Onion thrips. *Thrips tabaci* Lind.
 Pear thrips. *Tæniothrips pyri* Daniel.
 Red-banded thrips. *Heliothrips rubrocinctus* Giard. (See Fruits.)

SCALES, BUGS, APHIDS (HEMIPTERA).

- San José scale. *Aspidiotus perniciosus* Comstock.
 Apricot scale. *Epidiaspis piricola* Del Guercio. (See Apricot.)
 Greedy scale. *Aspidiotus camelliae* Signoret (*rapax* Comstock). (See Asparagus.)
 Box scales. *Aspidiotus* (*Chrysomphalus*) *dictyospermi* Morgan, *Aspidiotus britannicus* Newstead, and *Pinnaspis buxi* Bouché. (See Box.)
 Catalpa scale. *Diaspis pentagona* Targioni. (See Catalpa.)
 Citrus scales. *Aspidiotus orientalis* Newstead and *Parlatoria zizyphus* Lucas. (See Citrus.)
 Coconut palm scale. *Aspidiotus* (*Chrysomphalus*) *persea* Comstock. (See Coconut palm.)
 Fig scales. *Conchaspis angræci* Cockerell and *Lepidosaphes ficus* Signoret. (See Ficus.)
 Hawthorn scales. *Lecanium bituberculatum* Targioni. (See Hawthorn.)
 Mango scales. *Coccus mangiferae* Green and *Leucaspis indica* Marlatt. (See pl. I, fig. 1.) (See Mango.)
 Oak scales. *Asterolecanium variolosum* Ratzeburg. (See Oak.)
 Orchid scales. *Aspidiotus* (*Targionia*) *biformis* Cockerell, *Parlatoria proteus* Curtis, and *P. pseudaspidotus* Lindinger. (See Orchid.)
 Pear scale. *Aspidiotus* (*Diaspidiotus*) *ostreaformis* Curtis. (See Pear.)
 Rose scale. *Leucaspis japonica* Cockerell. (See Rose.)
 Sago palm scale. *Diaspis zamiae* Morgan. (See Sago Palm.)
 Sugar-cane mealy-bug. *Pseudococcus texensis* Tinsley. (See Sugar cane.)
 Black scale. *Saissetia oleae* Barnard.
 Fluted scale. *Icerya purchasi* Maskell. (See pl. II, fig. 2.)
 Oystershell scale. *Lepidosaphes ulmi* Linnæus.
 Purple scale of the orange. *Lepidosaphes beckii* Newman.
 Hop aphid. *Phorodon humuli* Schrank.
 Spinach aphid. *Myzus persicae* Sulzer.
 Cabbage aphid. *Aphis brassicae* Linnæus.
 Melon aphid. *Aphis gossypii* Glover.
 Pea aphid. *Macrosiphum pisi* Kaltenbach.
 Bean aphid. *Aphis rumicis* Linnæus.
 Wheat plant louse. *Aphis avenae* Fabricius.
 Pear-tree psylla. *Psylla pyricola* Förster.
 Tarnished plant-bug. *Lygus pratensis* Linnæus.
 Cotton stainer. *Dysdercus suturellus* Herrich-Schaeffer. (See Cotton.)

BEETLES (COLEOPTERA).

- Beet carrion beetle. *Blitophaga opaca* Linnæus. (See Beet.)
 Red-legged ham beetle. *Necrobia rufipes* De Geer.
 Leather beetles. *Dermestes vulpinus* Fabricius and *D. frischii* Kugclann.
 Pear borer. *Agrilus sinuatus* Olivier. (See Pear.)
 Confused flour beetle. *Tribolium confusum* Duv.
 Saw-toothed grain beetle. *Silvanus surinamensis* Linnæus.
 Cadelle or bolting-cloth beetle, *Tenebrioides mauritanicus* Linnæus.

Lesser grain-borer, *Rhizopertha dominica* Fabricius.
 Drug-store beetle, *Sitodrepa panicea* Linnæus.
 Cigarette beetle, *Lasioderma serricorne* Fabricius.
 Rust-red flour beetle, *Tribolium ferrugineum* Fabricius.
 Poplar borer. *Saperda carcharias* Linnæus. (See Poplar.)
 Willow leaf-beetle. *Phyllodecta vitellinae* Linnæus. (See Willow.)
 Elm leaf-beetle. *Galerucella luteola* Müller.
 Crucifer leaf-beetles. *Phyllotreta vittata* Fabricius and *P. armoraciae* Koeh. (See Crucifer.)
 California grape rootworm. *Adorus obscurus* Linnæus. (See Grape.)
 Beet tortoise beetle. *Cassida nebulosa* Linnæus. (See Beet.)
 Asparagus beetle. *Crioceris asparagi* Linnæus. (See Asparagus.)
 Asparagus beetle. *Crioceris 12-punctata* Linnæus. (See Asparagus.)
 Bean weevils. *Mylabris*¹ *rufimanus* Boheman, *M. pisorum* Linnæus, *M. lentis* Frölich, *A canthoscelides* obtectus Say, *Pachymerus chinensis* Linnæus, *P. quadrimaculatus* Fabricius. (See Beans.)
 The poplar and willow eurculio. *Cryptorhynchus lapathi* Linnæus. (See Alder, Birch, Poplar.)
 Austrian alfalfa leaf weevil. *Hypera meles* Fabricius. (See Alfalfa.)
 The clover leaf weevil. *Hypera punctata* Fabricius. (See Alfalfa.)
 The alfalfa weevil. *Hypera postica* Gyllenhal. (See Alfalfa.)
 Clover leaf weevils. *Hypera meles* Fabricius and *Hypera nigrirostris* Fabricius. (See Clover.)
 Broad-nosed grain weevil. *Caulophilus latinasus* Say. (See Avoeado.)
 Root weevils. *Polydrusus sericeus* Schaller and *P. viridicollis* Baudi. (See Beech.)
 Coffee-bean weevil. *Aræcerus fasciculatus* De Geer. (See Corn.)
 Sweet-potato weevil. *Cylas formicarius* Fabricius.
 Clover root weevils. *Sitona flavescens* Marsh and *Sitona hispidula* Fabricius. (See Clover.)
 Strawberry root weevil. *Brachyrhinus ovatus* Linnæus (*Otiorhynchus*). (See Conifers.)
 Grain weevils. *Calendra granaria* Linnæus and *C. oryza* Linnæus. (See Corn.)
 Grape root weevil. *Brachyrhinus sulcatus* Fabricius. (See Grape.)
 Fruit-tree bark beetle. *Scolytus rugulosus* Ratzeburg.

MOTHS (LEPIDOPTERA).

The gipsy moth. *Porthetria dispar* Linnæus. (See Forests.)
 The cotton bollworm. *Chloridea obsoleta* Fabricius.
 The beet army worm. *Laphygma exigua* Hübner (*Caradrina*).
 The apple moth. *Argyresthia conjugella* Zeller. (See Apple.)
 Horse-chestnut borer. *Zeuzera pyrina* Linnæus. (See Horse-chestnut.)
 Beech tortrieid. *Peronea ferrugana* Treitsehke. (See Beech, Birch.)
 Hawaiian beet webworm. *Hymenia fascialis* Cramer. (See Beet.)
 Beet worm. *Plusia gamma* Linnæus. (See Beet.)
 Diamond-back moth. *Plutella maculipennis* Curtis. (Attacks turnip, cabbage, cauliflower.)
 Cabbage webworm. *Hellula undalis* Fabricius.
 Celery leaf-tyer. *Phlyctænia ferrugalis* Hübner.
 European pine-shoot moth. *Evetria buoliana* Schiffermiller. (See Conifers, C.)
 Pine bud and gall moths. *Evetria turionana* Hübner; *E. pinivorana* Zeller; *E. duplana* Hübner. (See Conifers, C.)
 Brown-tail moth. *Euproctis chrysorrhæa* Linnæus. (See Forests.)
 Pea moth. *Laspeyresia nigricana* Stephens. (See Pea.)
 Sugar-cane borer. *Diatraea saccharalis* Fabricius. (See Sugar cane.)
 Mediterranean flour moth. *Ephestia kuehniella* Zeller.
 Imported cabbage butterfly. *Pontia rapæ* Linnæus.
 Angoumois grain moth. *Sitotroga cerealella* Olivier.
 Codling moth. *Laspeyresia pomonella* Linnæus.
 European grain moth, *Tinea granella* Linnæus.
 Indian-meal moth, *Plodia interpunctella* Hübner.
 Fig moth, *Ephestia cautella* Walker.
 Cutworms, *Peridroma*, *Agrotis*, *Feltia*, etc.

SAWFLIES (HYMENOPTERA).

Coniferous sawfly. *Diprion simile* Hartig. (See Conifers, B.)
 Currant worm. *Pteronidea ribesii* Scopoli.
 Rose sawfly, *Cladius pectinicornis* Fouc.
 Larch sawfly, *Nematus erichsoni* Hartig.
 Rose sawfly *Caliroa aethiops* Fabricius.
 Plum sawfly, *Eriocampoides limacina* Retzius.
 Elm sawfly, *Fenusa dohrnii* Tischbein.

¹ The generic name *Mylabris* Geoffroy 1762 has precedence over *Laria* Scopoli and *Bruchus* Linnæus as used for the bean weevils and is the name which should be followed in future literature.—W. D. Pierce.

FLIES (DIPTERA).

Imported cabbage maggot. *Chortophila (Pegomya) brassicæ* Bouché.
Seed-corn maggot. *Chortophila (Pegomya) fusciceps* Zetterstedt.
Grain gall midge. *Contarinia tritici* Kirby. (See Grains.)
Hessian fly. *Phytophaga destructor* Say (*Mayetiola*). (See Grains.)
Pear gall midge. *Contarinia pyrivora* Riley. (See Pear.)
Imported onion maggot. *Chortophila (Pegomya) cepetorum* Medde.
Spinach leaf miner. *Chortophila (Pegomya) hyoscyami* Linnæus (*vicina* Lintner).

INSECTS SPECIALLY LIABLE TO IMPORTATION AT ANY TIME.

There are certain groups of insects which are uniformly injurious and can not therefore be given full justice in a bulletin of this type. These insects should be especially guarded against and excluded on general principles, whether incriminating evidence is found or not.

TERMITES (TERMITIDÆ).

There have been several cases of introduction of termites into the United States, notable among which was the importation of *Leucotermes lucifugus* Rossi in packing boxes from Germany. The termites are uniformly injurious to wood and plant growth and may be imported in any type of wood, whether in the form of nursery stock, lumber, or manufactured product. A list of species is to be found in Wytsman's Genera Insectorum by Desneux (1903).

THRIPS (THYSANOPTERA).

The tiny fringe-winged thrips are very destructive to many crops, and should always be guarded against.

SCALE INSECTS (COCCIDÆ).

These tiny insects are inconspicuous and the greatest of care is necessary on the part of inspectors to prevent their introduction. This family may be considered, as a whole, a most undesirable group of insects. Many species have already been introduced and become serious pests. Reference to Mrs. Fernald's Catalogue of Coccidæ as well as Technical Bulletins 12 and 16 of the Bureau of Entomology will give full data as to literature. L. Lindinger, in his "Die Schildläuse (Coccidæ)," gives tables to the species of European scale insects attacking each plant. All names of scale insects used in this bulletin have been verified by Mr. E. R. Sasser. Several genera of scales are illustrated on plates I-V to assist in determination. Some of the species illustrated are not treated in the text, although congeneric species are.

WHITE FLIES (ALEYRODIDÆ).

The tiny white flies are very apt to slip in past even a zealous inspector. The flattened scalelike larvæ of some species look so much like the plant tissue that they are easily overlooked. The active little white-winged adults fly so quickly that rough handling would tend merely to disperse them and increase the dangers of introduction. Kirkaldy in 1907 issued a world checklist in Bulletin 2, Hawaii Board of Commissioners Agriculture and Forestry. (See Technical Bull. 27, of the Bureau of Entomology and Proc. U. S. Nat. Mus., No. 2156.)

RED SPIDERS; MITES (ACARINA).

These tiny eight-legged creatures are not insects, but so closely related that they are generally treated as such. The red spiders are exceedingly minute and occur on almost every type of vegetation. As their rate of multiplication is very rapid

they have become serious pests to agriculture. There are a number of four-legged blister mites of great importance and yet so small that they can only be seen with a very high power lens.

BARKBEETLES (SUPERFAMILY SCOLYTOIDEA: FAMILIES IPIDÆ, SCOLYTOPLATYPODIDÆ, SCOLYTIDÆ, AND PLATYPODIDÆ).

All of the bark beetles, ambrosia beetles and other members of this family are more or less injurious to tree growth, forest products, tree seeds, fruits, etc., and species known to be injurious must be carefully guarded against. These beetles are small, cylindrical with elbowed and clubbed antennæ. The head is without or with very short beak and the submentum is without a gular peduncle. In Ipidæ and Scolytidæ (Hopkins's classification) the first joint of the tarsus is shorter than the others combined, while in Platypodidæ the first joint is as long or longer than the others. They all bore in the plant tissue to deposit their eggs and their burrows or galleries are characteristic of groups, genera, and species. The food consists of plant tissue except in the ambrosia beetles where it consists of so-called ambrosia fungi. Genera Insectorum has issued a fascicle on Ipidæ=Superfamily Scolytoidea of Hopkins,¹ with catalogue of species of the world.

BEAN WEEVILS (MYLABRIDÆ—BRUCHIDÆ, LARIIDÆ).

The seed weevils or bruchids breed almost entirely in the seeds of plants, especially of the bean and pea family. They are uniformly injurious and should be excluded. These beetles are usually small and either oval or elongate, with the head carried in a downward position and with the antennæ often pectinate or plumose. The elytra do not completely cover the abdomen. A catalogue of the Mylabridæ (Bruchidæ) has been issued by Junk.

CUTWORMS; ARMY WORMS (NOCTUIDÆ).

Several species of cutworms and army worms have already become world wide in their distribution through their strong flying ability and by commerce. As the larvæ are very generally destructive and not at all exclusive in food habits, they need to be carefully guarded against. Larvæ may be transported anywhere on the ships. *Cirphis unipuncta* Haworth, the army worm; *Spodoptera mauritia* Boisduval, the grass army worm, and *Agrotis ypsilon* Rottenburg, the greasy cutworm, are practically cosmopolitan. A discussion of most of the injurious species will be found in Sorauer's *Handbuch der Pflanzenkrankheiten*, 3d ed., 1913, vol. 3, pp. 348-374.

WEEVILS. RHYNCHOPHORA—COLEOPTERA.

The experience of the last few years in the quarantine of horticultural products has shown that one of the groups most likely to introduction is the group of weevils which comprise a large section of the order Coleoptera.

Owing to the development of many species of weevils in the roots, stems, and fruit of almost every type of plant known, it is very easy to introduce them in immature stages in such a manner that they may take hold and attack the introduced plant. Owing to the necessity of determining practically all of the weevils introduced by a search through foreign literature a majority of the species so far introduced

¹Tech. Series 17, part II, Bureau of Entomology, U. S. Dept. of Agric., 1915.

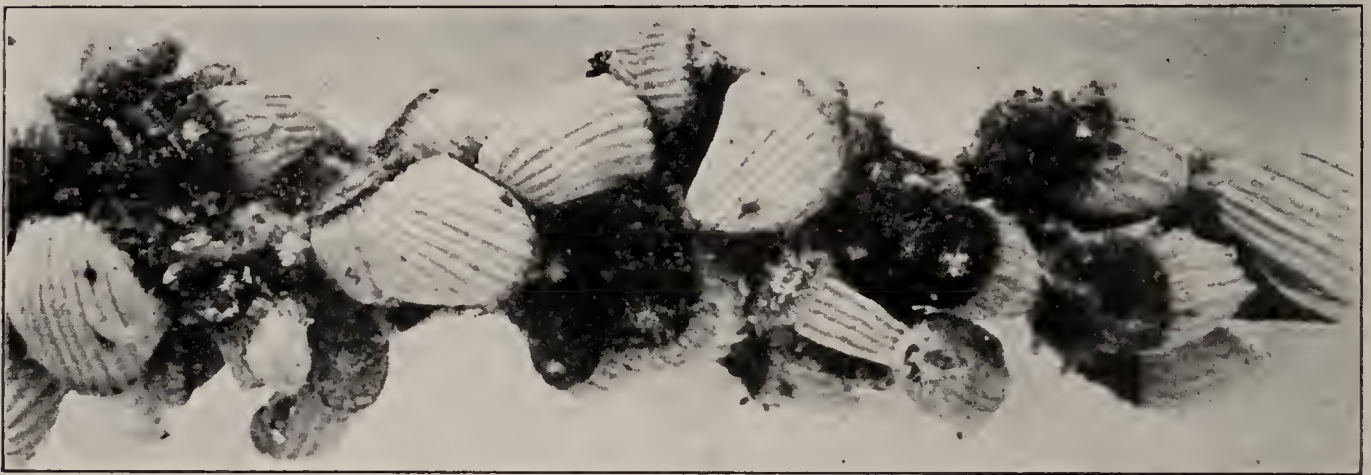


DANGEROUS SCALE INSECTS.

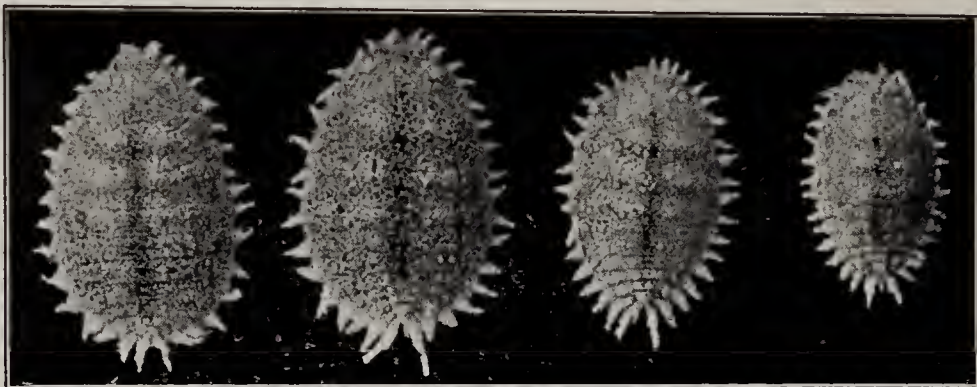
The mango scale (**Leucaspis indica*), upper figures. The hackberry scale (**Lecaniodiaspis celtidis*), lower figures. (Original, Sasser.)



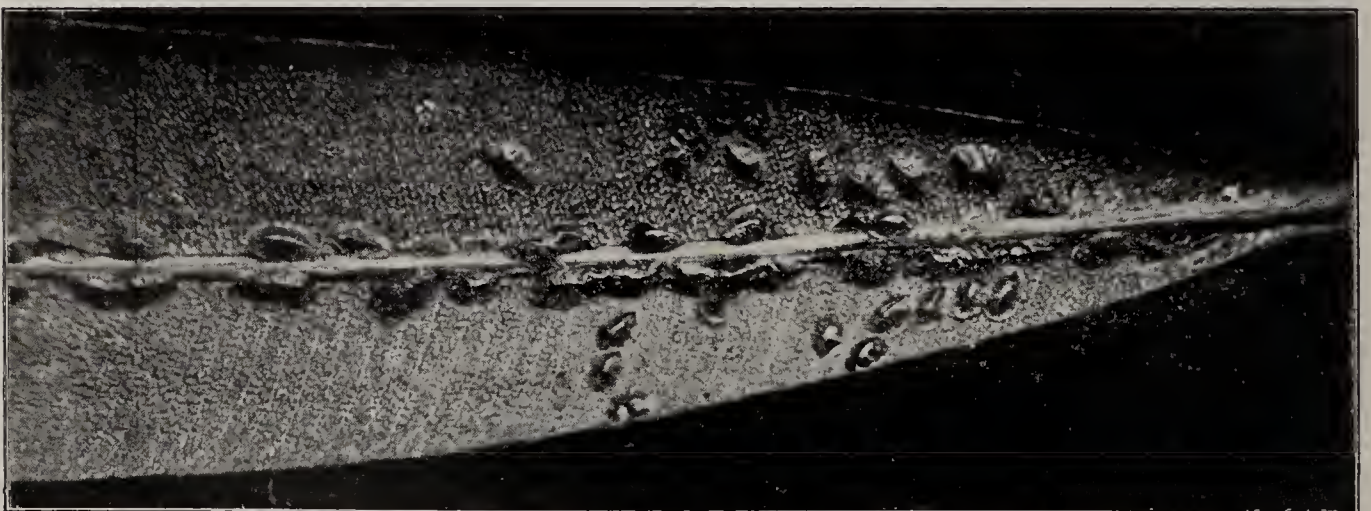
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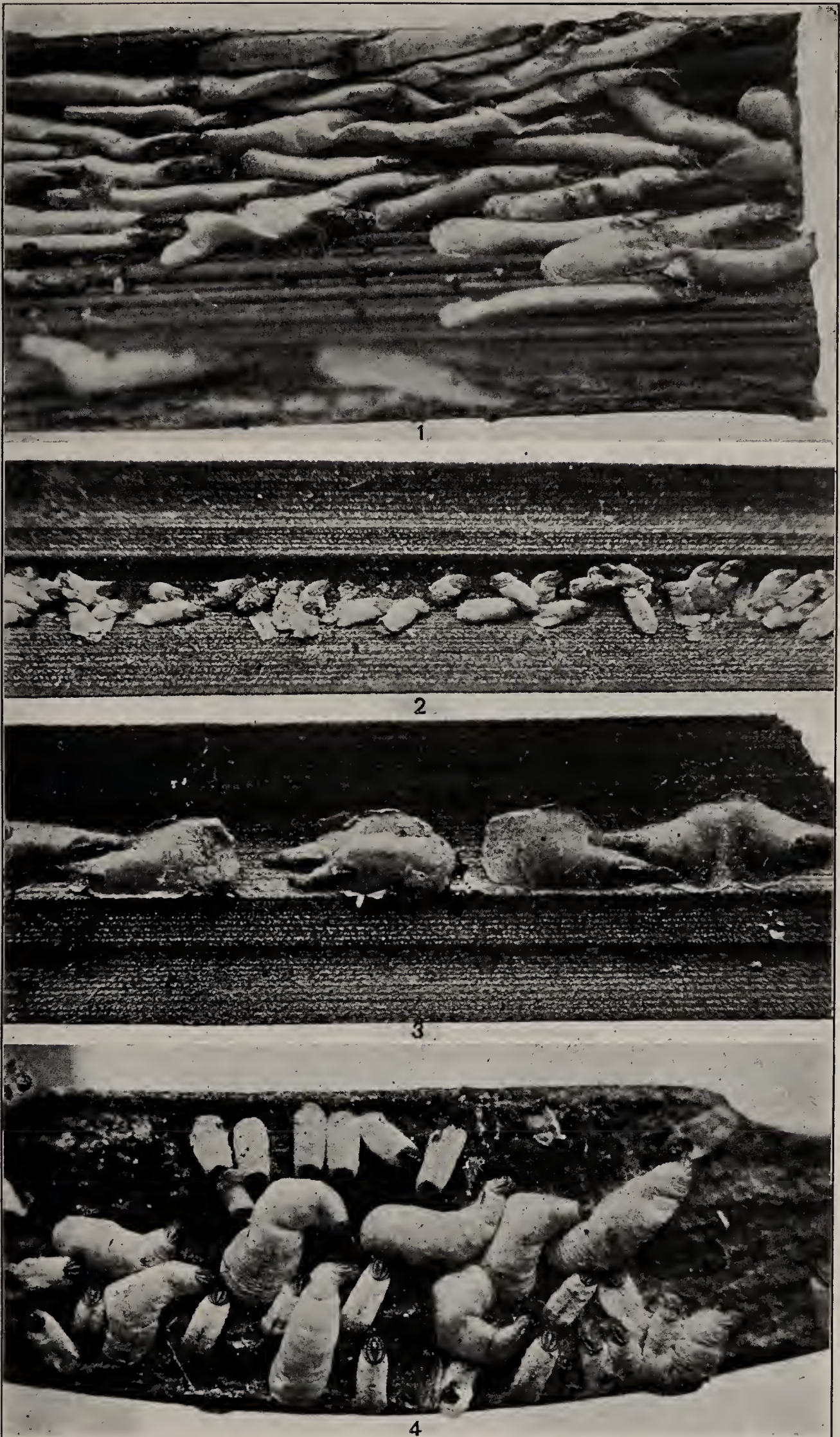
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DANGEROUS SCALE INSECTS.

FIG. 1.—The bamboo scale (*Chionaspis graminis*). FIG. 2.—The fluted scale (*Icerya purchasi*).
FIG. 3.—The citrus scale (*Pseudococcus citri*). FIG. 4.—*Coccus hesperidum*, a scale of citrus,
tea, and palms. (Original, Sasseer.)



AUSTRALIAN SCALE INSECTS.

FIG. 1.—The cordyline scale (*Leucaspis cordylinidis*). FIGS. 2, 3.—A scale (*Lepidosaphes pallens*), of *Xanthorrhoea*. FIG. 4.—A scale (*Chionaspis nitida*) of *Daviesia corymbosa*. (Original Sasser.)



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DANGEROUS SCALE INSECTS.

FIG. 1.—The Atriplex scale (*Pulvinaria maskelli*). FIG. 2.—A scale (**Orthezia insignis*) of citrus, tea, etc. FIG. 3.—The plum and peach scale (*Iecanium prunastri*). (Original, Sasser.)



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DANGEROUS SCALE INSECTS.

FIG. 1.—The cosmopolitan tea and olive scale (*Fiorinia theae*). FIG. 2.—The Mexican agave scale (*Chrysomphalus agavis*). FIG. 3.—The date palm scale (*Parlatoria blanchardi*). (Original, Sasseer.)

have not been determined or described. For this reason many important species are not included in the present edition.

The larvæ of weevils are white or yellowish with a dark head shield and are usually found in a more or less curved position. Most of them are rather robust and with a very few exceptions have no legs or rudiments thereof.

The pupa can always be distinguished by the presence of the beak lying flattened between the legs.

The adult weevils are distinguished by the prolongation of the head into a beak. This may be very short and broad or very long and slender. They are furthermore characterized by having the tarsi four-jointed. Inspectors are urged to take every possible precaution against the introduction of any species of weevils and where immature or adult stages are found they should immediately place them in alcohol and send them to Washington for determination.

DANGEROUS FOREIGN INSECTS LIKELY TO BE INTRODUCED IN THE UNITED STATES THROUGH IMPORTATIONS, ARRANGED BY HOST PLANTS.

ACACIA; WATTLES.

(*Acacia* spp. Family Leguminosæ.)

This genus contains several hundred species distributed throughout the world in semitropical and temperate climates. The gum arabic of commerce is derived from *Acacia senegal*; a drug of commerce is obtained from the wood of *A. catechu*; a soap or hair wash from *A. concinna*; others furnish dyes, fiber, scented wood, or valuable timber. A number of species of this genus or very nearly related to it grow in our Southern States.

IMPORTANT ACACIA PESTS.

HEMIPTERA.

Coccidæ.

Armored—

Aspidiotus (Targionia) acaciæ Morgan; New South Wales, Tasmania; *Acacia pycnantha*.

Aspidiotus tasmanix Green; Australia.

Aspidiotus (Pseudaonidia) quadriareolata Malenotti; Africa; *A. asak*.

Fiorinia acaciæ Maskell; Australia, New Zealand; *A. pycnantha*, *A. pulchella*, *A. longifolia*.

Lepidosaphes acaciæ Maskell; Australia; *A. linifolia*.

Lepidosaphes spinifera Maskell; Australia; *A. pendula*.

Lepidosaphes somalensis Malenotti; East Africa; *A. asak*.

Protodiaspis anomala Green; Australia.

Pseudotargionia glandulosa Newstead; Egypt; *A. arabica*.

Unarmored—

Akermes scrobiculatus Maskell; Australia.

Akermes levis Maskell; Australia; *A. longifolia*.

Asterolecanium ventuosum Maskell; Australia.

Ceroplastes erithræus Leonardi; Africa.

Ceroplastes mimosæ Signoret; Egypt; *A. arabica*.

Cryptes baccatus Maskell; Australia; *A. armata*, *A. calamifolia*, *A. linearis*, *A. longifolia*, *A. melanoxylon*.

Epicoccus acaciæ Maskell; West Australia; *A. pulchella*.

Kermes acaciæ Maskell; Australia.

Lecaniodiaspis acaciæ Maskell; West Australia; attacks *A. calamifolia*, *A. cyanophylla*, *A. microbotrya*, and *A. longifolia*.

Lecaniodiaspis africana Newstead; Egypt; *A. arabica*.

Lecaniodiaspis dilatata Froggatt; Australia; *A. discolor*.

Pseudococcus acaciæ Maskell; Australia; *A. linearis*, *Albizzia lophanta*.

Coccidæ—Continued.**Unarmored—Continued.**

- Pseudococcus albizziae* Maskell; Australia, Hawaii; *A. dealbata*, *A. discolor*, *A. baileyana*.
Pseudococcus farnesianæ Targioni-Tozzetti; Italy; *A. farnesiana*. This is the huisache of the United States and is here known as *Vachellia farnesiana*.
Pseudococcus swezeyi Ehrhorn; Hawaii; *A. koa*.
Pseudococcus nitidus Brain; South Africa; *A. caffra*.
Pseudococcus quaesitus Brain; South Africa; *A. caffra*, *A. robusta*, *A. horrida*.
Pseudococcus solitarius Brain; South Africa.
Pseudococcus filamentosus Cockerell; Jamaica, Mauritius, Hawaii, Japan; attacks *A. arabica* in Egypt.
Rhizococcus lobatulatus; Australia; *A. pendula*.
Saissetia mirifica Maskell; Australia; *A. pendula*.
Sphærococcus acaciæ Maskell; Australia.
Tachardia acaciæ Maskell; Australia; *A. greggii*.

COLEOPTERA.**Buprestidæ.**

- Melobasis splendida* Donovan; Australia; breeds in dead branches of *Acacia longifolia*.

Scarabæidæ.

- Diphucephala aurulenta* Kirby; Australia; attacks foliage of black wattle.
Heterorhina hookeri White; India; attacks foliage of *Acacia catechu*.
Melolontha hippocastani Fabricius and *M. melolontha* Linnæus; Europe; larvæ attack roots of seedlings.
Polyphylla fullo Linnæus; Europe; larvæ attack roots of seedlings and adults attack foliage.

Cerambycidæ.

- Cælosterna spinator* Fabricius; India; bores in shoots of *A. arabica*.
Lygesis mendica Pascoe; Australia; bores in twigs of black wattle.
Pachydissus sericus Newman; Australia; breeds in trunks and branches of *A. longifolia*, *A. decurrens*.
Piesarthrius marginellus Hope; Australia; breeds in wood of *A. longifolia*.
Sternotomis bohemani Chevrolat; German East Africa.
Symphyletes neglectus; Australia; girdles branches of *A. longifolia*.
Symphyletes nigrovirens; Australia; *A. juniperina*.
Symphyletes vestigialis; Australia.
Uracanthus triangularis Hope; Australia; attacks branches of black wattle.
Uracanthus strigosus, *U. bivittata* and *U. simulans*; Australia; attack *A. longifolia*.

Chrysomelidæ.

- Elaphodes tigrinus*; Australia; defoliator.
Paropsis piceæ Oliver; Australia; attack foliage of black wattle.

Curculionidæ (sens. lat.).

- Chrysolophus spectabilis* Fabricius; Australia; black wattle.
Leptops tribulus Fabricius; Australia; black wattle.
Rhinotia hæmoptera Kirby; Australia; breeds in stems of *Acacia suaveolens*.
Mylocerus acaciæ; India.

LEPIDOPTERA.**Cossidæ.**

- Zeuzera eucalypti* Boisduval, a goat moth; Australia; bores in the thicker branches and trunk of living trees of *Acacia decurrens*.

Geometridæ.

- Biston suppressarius* Gn., a defoliator; India; attacks *Acacia catechu*, and *A. modesta*, as well as other trees.
Euchloris submissaria Walker, *Lophodes sinistraria* Guer. and *Selidosema lyciaria* Gn. attacks the foliage of black wattle in Australia.
Selidosema excursaria and *Thalaina clara* Walker attack the foliage of wattles in Australia.

Hepialidæ.

- Pileus hyalinatus* breeds at the roots of wattles in Australia.
Charagia lignivora Lewin; Australia. (See Apple.)

Lymantriidæ.

- Teia anartoides* Walker, the wattle moth; Australia; skeletonizes foliage. (See Fruit.)
Teara contraria Walker; Australia; defoliates.

Xyloryctidæ.

Cryptophaga rubiginosa; Australia; bores in twigs.

Tortricidæ.

Argyroplote illepida Buhl.; Australia; India; Ceylon; Africa; attacks seed pods of *Acacia farnesiana*.

HYMENOPTERA.

Formicidæ (sens. lat.).

Camponotus ligniperda Latreille; an ant; Europe; attacks living wood.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3:

FROGGATT. Australian Insects.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

FERNALD, MARIA E. Mass. Agr. Exp. Sta. Bull. 88, 1903.

ALDER.

(*Alnus* spp. Family Betulaceæ.)

Hardy ornamental trees and shrubs grown in Asia, Europe, North America, and South America. *Alnus rubra* is the most important timber tree. The genus is not attacked by many very serious pests, but any of the wood borers, especially, might become serious when transported to another country in nursery stock. Several pests have gained admission to the United States in some manner. These are indicated by an asterisk.

A. AN ALDER PEST LIKELY TO BE IMPORTED.

Coleophora fuscadinella Zell.

(Alder Bud Moth. Elachistidæ; Lepidoptera.)

Host: Alder.

Injury: Attacks buds and foliage.

Description and biology: *Adult* moth with wing expanse 10–13 mm., forewings dark brownish gray, in the male with a little yellowish; hind wings dark gray. *Egg* overwinters in buds. *Larva* chocolate brown, head and thoracic shield black; third and fourth pairs of prolegs rudimentary. Feeds in buds and on foliage. *Pupates* in case.

Distribution: Germany.

NÜSSLIN, Otto. Leitfaden der Forstinsektenkunde, 2d ed., 1913. p. 433.

B. OTHER IMPORTANT ALDER PESTS.

ACARINA.

Eriophyidæ.

Eriophyes laevis Nalepa, a blister gall mite; England; on leaves of *Alnus glutinosa*.

ORTHOPTERA.

Aceridiidæ.

Podisma alpina Koll., a green grasshopper of the mountain sections of Europe, Amur, and Japan; very destructive at times.

HEMIPTERA.

Psyllidæ.

Psylla alni Linnæus, a sucking bug; Germany; breeds on the leaves.

Coccidæ.

Phenacoccus aceris Signoret; Europe; attacks *Alnus glutinosa*, and *A. incana*.

Pulvinaria betulæ alni Douglas; England; attacks *Alnus glutinosa*.

Lecanium capreæ Linnæus; England.

Lecanium corni Bouché; Europe; attacks *Alnus incana*.

Lecanium coryli Linnæus; Europe; attacks *A. glutinosa* and *A. incana*.

Chionaspis salicis Linnæus; Europe, Egypt; attacks *Alnus glutinosa*, *A. incana*, and *A. viridis*.

Hemichionaspis sp.; Japan.

Aspidiotis (*Targionia*) *alni* Marchal; France; attacks *Alnus glutinosa*.

COLEOPTERA.

Anobiidæ.

Xestobium rufovillosum De Geer, a brown wood-boring beetle; Europe; injures the wood for technical purposes.

Ptilinus pectinicornis Linnæus, a shining dark-brown wood-boring beetle; Europe; injures the wood for technical purposes.

Buprestidæ.

**Agrilus viridis* Linnæus, a greenish wood-boring beetle; Europe; bores in the wood of stems and branches. (See Oak.)

Lampra rutilans Fabricius (*Pæcilonota*), a yellowish-red wood-boring beetle with greenish or bluish shimmer; Europe; bores in the bast and sapwood of branches.

Scarabaeidæ.

Anomala grandis Hope, a large bright-green beetle; India; adult strips leaves, larvæ at roots of *Alnus nepalensis*.

Melolontha hippocastani Fabricius, a large May beetle; Europe; gnaws roots.

Melolontha melolontha Linnæus, a large May beetle; Europe; gnaws roots.

Cerambycidæ.

Oberea linearis Linnæus, a long-horned wood-borer; Europe; attacks nursery stock especially.

Chrysomelidæ.

Agelastica alni Linnæus, a blue leaf beetle; Europe; larvæ and adults skeletonize foliage.

Haltica quercetorum Foudr., a metallic blue or green leaf beetle; Europe; larvæ and adults skeletonize foliage. (See Oak.)

Melasoma ænea Linnæus, a leaf beetle; Europe; larvæ and adults skeletonize leaves.

Attelabidæ.

Apoderus coryli Linnæus, a long-necked weevil; Europe; adults roll leaves into nests for young.

Rhynchitidæ.

Byctiscus betulæ Linnæus, a metallic blue or green leaf-rolling weevil; Europe.

Rhynchites betulæ Linnæus, a brown or black leaf-rolling weevil; Europe.

Curculionidæ.

**Cryptorhynchus lapathi* Linnæus, a weevil; Europe, and introduced into the United States; bores in young shoots, branches, bark, and wood. It attacks also poplars and willows in the Eastern United States and is an important pest.

Hylobius abietis Linnæus, an elongate weevil; Europe; bores in bark of seedlings.

Orchestes alni Linnæus, a jumping weevil; Europe; mines the leaves.

Orchestes testaceus scutellaris Zetterstedt, a jumping weevil; Europe; mines the leaves.

Scolytidæ.

Anisandrus dispar Fabricius, a small wood-boring beetle; Germany; breeds in galleries in wood.

Dryocætes alni Georg, a bark beetle; Germany; breeds in galleries in bark and sapwood.

Trypophlæus alni Lindemann, a bark beetle; Europe; breeds in galleries in bark and sapwood of *Alnus incana*.

Xyloterus domesticus Linnæus, an ambrosia beetle; Germany; breeds in galleries in wood and sapwood.

LEPIDOPTERA.

Tortricidæ.

Peronea ferrugana S. V., a greenish leaf-feeding larva; Europe, North America.

Cossidæ.

Cossus cossus Linnæus, a goat moth; Europe; bores in the wood. (See Willow.)

**Zeuzera pyrina* Linnæus, a white moth; Europe, Africa, North America; bores in the wood. This is an important pest. (See Horse chestnut.)

Sesiidæ.

Sesia culiciformis Linnæus, a clear-winged moth; Europe; bores in bark and stumps of branches.

Sesia spheciformis Gerning, a clear-winged moth; Europe; bores in wood.

Geometridæ.

Anisopteryx æscularia Schiffermiller, a greenish measuring-worm; Europe; feeds on foliage.

Larentia dilutata Borekh., a measuring-worm; Central Europe; feeds on foliage.

Lymantriidæ.

Dasychira pudibunda Linnæus, the red-tail moth. (See Forest defoliators.)

**Porthetria dispar* Linnæus, the gipsy moth. An important pest in New England. (See Forest defoliators.)

Notodontidæ.

Phalera bucephala Linnæus, the moon-flecked moth. (See Forest defoliators.)

HYMENOPTERA.

Cimbicidæ.

Cimbex variabilis Klg., a sawfly; Europe; breeds on the foliage.

Trichiosoma lucorum Linnæus, a sawfly; Europe; breeds on the foliage.

Tenthredinidæ.

Nematus (Cræsus) septentrionalis Linnæus, a sawfly; Europe; breeds on the foliage.

Phyllotoma vagans Fallén, a sawfly; Europe; breeds on foliage.

Xiphydridæ.

Xiphydrya camelus Linnæus, a wood wasp; Europe; breeds in the wood.

LITERATURE.

SORAUER, P.: Handbuch, der Pflanzenkrankheiten 3d ed., vol. 3, by Lindau and Reh, 1913.

NÜSSLIN, OTTO.: Leitfaden der Forstinsektenkunde, 2d ed., 1913.

BARGAGLI, P.: Rassegna Biologica Rincofori Europei, 1883-1887.

LINDINGER, L.: Die Schildläuse (Coccidæ), 1912.

ALFALFA; LUCERNE.

(*Medicago sativa* Linnæus. Family Leguminosæ.)

Alfalfa is a staple forage plant in many parts of the world, being grown extensively in Europe, Asia, and South America, as well as in this country. Except in shipments of hay, the only danger of introducing pests is with the seed. Some very important European pests of alfalfa have in some manner already reached this country and are doing serious damage.

Most insects attacking clover are potential alfalfa pests and it is therefore advisable to consult the list of clover pests when dealing with alfalfa.

A. BETTER KNOWN ALFALFA PESTS LIKELY TO BE IMPORTED.***Colaspidema atrum* Olivier.**

(Black Alfalfa Leaf Beetle. Chrysomelidæ; Coleoptera.)

Host: Alfalfa.

Injury: Very serious.

Description and biology: A small shining black beetle with brownish tint on sides. Larva about 6 mm. long, blackish. Oviposits on leaves and tender shoots. The larvæ feed on the foliage and move from field to field in armies. Pupates in the soil.

Distribution: Spain, Southern France.

CLARIÓ-SOULÁN, I. V., and COMAS, J. N.: Dos plagas que atacan á los Alcornocales y Alfalfaes. Servicio Agron. Nacional Prov. Barcelona, 1911, pp. 9-11.

***Hypera murina* Fabricius (Phytonomus).**

(Alfalfa Leaf Weevil. Curculionidæ; Coleoptera.)

Hosts: Alfalfa (*Medicago sativa* L. and *M. s. falcata* L.)

Injury: Defoliates, very injurious.

Description: Weevil dull brown, oval, about 4 mm., covered with fine gray and brown hairs. Oviposits in stems long rows of eggs. Larvæ feed on the foliage. Pupates in silken cocoon on plant.

Distribution: Europe.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887, pp. 94, 95.

* *Hypera meles* Fabricius (*Phytonomus*).

(Austrian Alfalfa Leaf Weevil. Curculionidæ; Coleoptera).

FIG. 1.—*Chrotogonus trachypterus*. An Indian pest of alfalfa. (Maxwell-Lefroy.)FIG. 2.—*Brachytrypes achatinus*. An Indian pest of alfalfa. (Maxwell-Lefroy.)**Gryllidæ.***Brachytrypes achatinus* Stoll., a brown cricket of India. (See text fig. 2.)

LEPIDOPTERA.

Noctuidæ.*Prodenia litura* Fabricius, also known as the Egyptian cotton worm, attacks alfalfa in India.*Plusia nigrisigna* Walker, attacks fruit in India.* *Chloridea obsoleta* Hübner, the cotton bollworm; * *Agrotis ypsilon* Rott., the greasy cutworm; and* *Laphygma exigua* Hübner, serious pests already in the United States, attack alfalfa in India.**Tortricidæ.***Tortrix divulsana* Walker, the lucerne moth of New South Wales; spins the heads together and feeds on them.

COLEOPTERA.

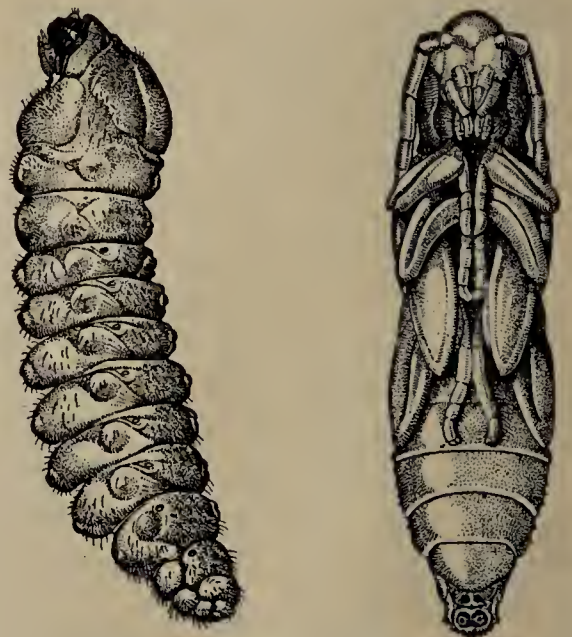
Coccinellidæ.*Subcoccinella 24-punctata* Linnæus; Europe; larvæ and adults injure the foliage.**Cerambycidæ.*** *Clytus floralis* Pall.; Russia, imported to United States in roots; root borer. (See text fig. 3.)**Curculionidæ.*** *Hypera punctata* Fabricius, the clover-leaf weevil of Europe, now common in the United States; also attacks alfalfa.* *Hypera postica* Gyllenhal, the alfalfa weevil of Europe, introduced into western United States, and very injurious. (See text fig. 4, a-f.)*Apion meliloti* Kirby, a tiny weevil; Europe; breeds in the pith of the stems.*Apion tenue* Kirby, a tiny weevil; Europe; breeds in stems.*Hosts*: Alfalfa, Gramineæ.*Injury*: Defoliates.*Biology*: The larvæ feed on the foliage and spin silken cocoons.*Distribution*: Europe, and has been recently collected in the United States.**B. OTHER IMPORTANT ALFALFA PESTS.**

COLLEMBOLA.

Sminthuridæ.*Sminthurus* sp., a springtail, is very injurious to alfalfa in New South Wales, when abundant skeletonizing the fields in moist seasons.

(A. Molineux, Agric. Gaz. N. S. Wales, Nov., 1896, pp. 807-809.)

ORTHOPTERA.

Aceridiidæ.*Chrotogonus trachypterus* Blanchard, a destructive grasshopper of India. (See text fig. 1.)FIG. 3.—*Clytus floralis*. A Russian alfalfa root borer. (Original, Walton.)

Itonididæ.

**Asphondylia miki* Wachtl; gall midge; Europe, Arizona; forms galls in seed pods. (See text fig. 5.)

LITERATURE.

MAXWELL-LEFROY, H. Mem. Dept. Agr. India, Entom. ser. vol. 1, No. 2, June, 1907, pp. 113-252.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed. vol. 3, 1913.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887.

WEBSTER, F. M. U. S. Dept. Agric., Bur. Entomology, Bul. 112, 1912.

WEBSTER, F. M. U. S. Dept. Agric., Bur. Entomology, Circ. 147, 1912.

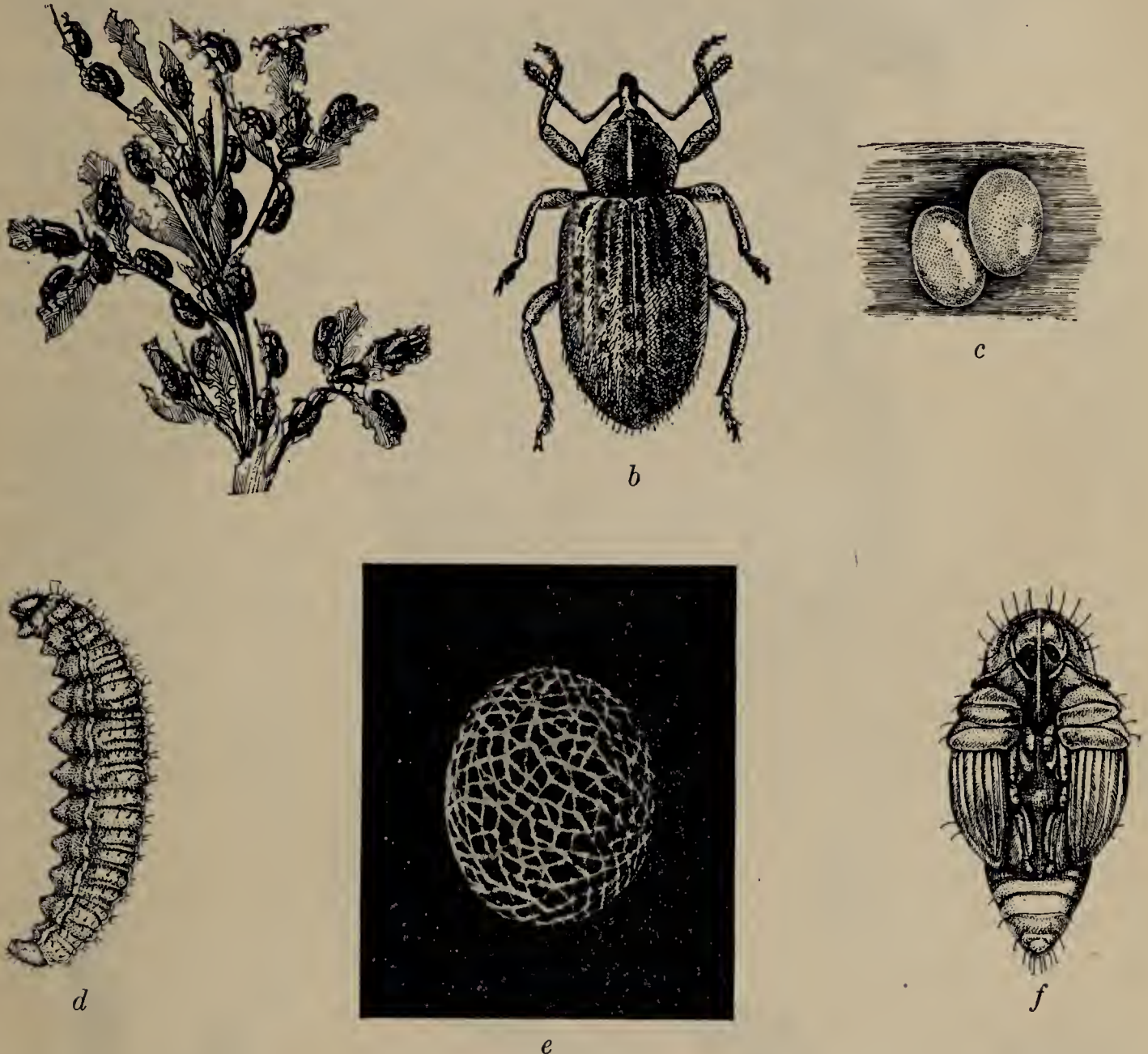
DIPTERA.

FIG. 4.—Alfalfa weevil (*Hypera postica*): *a*, Adults clustering on sprig of alfalfa; *b*, adult weevil; *c*, eggs; *d*, larva; *e*, cocoon; *f*, pupa. *a*, Natural size; *b*, *d*, *e*, *f*, much enlarged; *c*, greatly enlarged. (Webster.)

APPLE.

(*Malus malus*, etc. Family Rosaceæ.)

Fruit trees of America, Europe, and Asia, much cultivated in this country.

A. BETTER KNOWN APPLE INSECTS LIKELY TO BE IMPORTED.

Termes australis Hagen.

(The Victorian White Ant. Termitidæ; Isoptera.)

Hosts: Apples and other deciduous fruits, orange, Eucalyptus, vines, geraniums, timbers, furniture, books, etc.

Injury: Makes galleries in above plants and is also injurious to timbers in houses, furniture, etc.

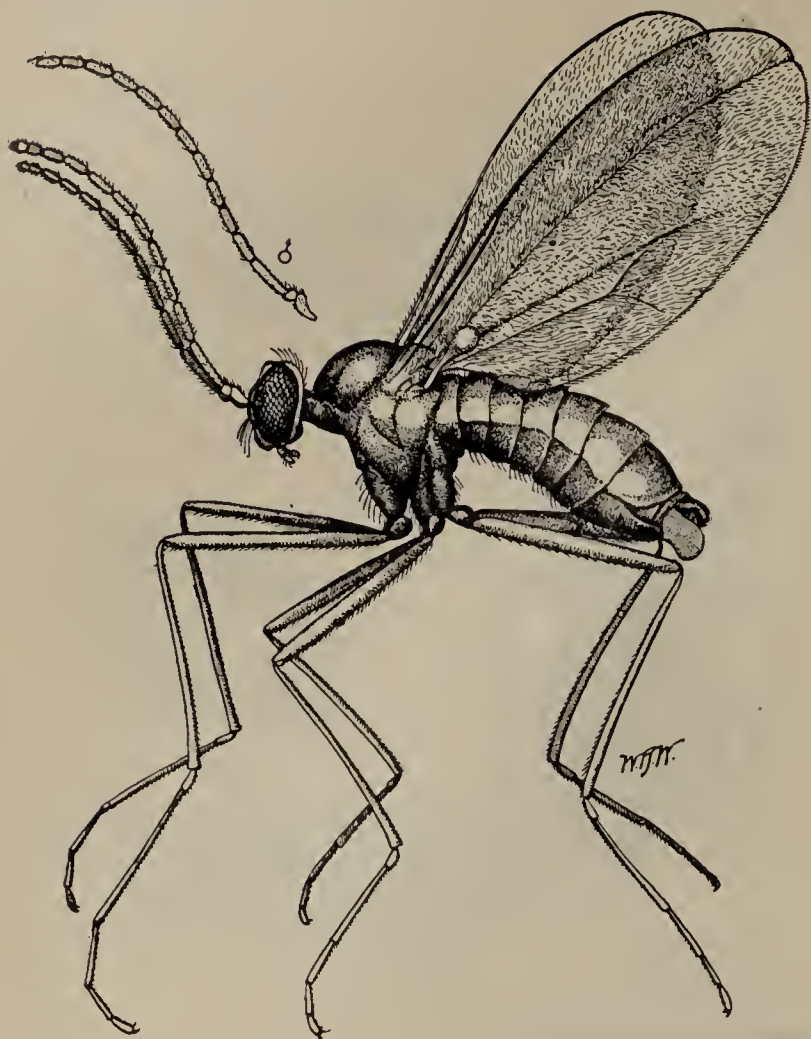


FIG. 5.—The alfalfa gall midge (*Asphondylia miki*): Adult female, with antenna of male above, at left. Greatly enlarged. (Original, Walton.)

the spurs, around leaf scars, in cracks, among fine hairs, on the new wood, and elsewhere. The nymphs hatch in spring as the buds begin to open and attack the blossom and leaf buds, often destroying the blossoms and greatly stunting the shoots. (See text fig. 6.)

Distribution: Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1893, pt. 2, pp. 136–144, plate 32.

Psylla mali Schmidbg.

(The Apple Psylla. Psyllidæ; Hemiptera.)

Hosts: Apple.

Injury: Very injurious in England.

Description and biology: Adult 2.5–3 mm. long; color variable from greenish to brownish yellow (some show dark markings, with even red or yellow); wing veins greenish or greenish yellow. *Nymphs* flat, at first yellow or dirty yellow, with brown markings and red eyes, later becoming green all over; body partly covered with white or pale-blue curly waxen threads, and there is a long thread with a waxy globule. *Eggs* creamy yellow, but before hatching are faintly dusty red in color. The winter is passed in the egg stage, the eggs being placed on



FIG. 6.—Apple psylla (*Psylla mali*): a, Adult; b, injured twig; c, nymph; d, eggs on shoot. (Theobald.)

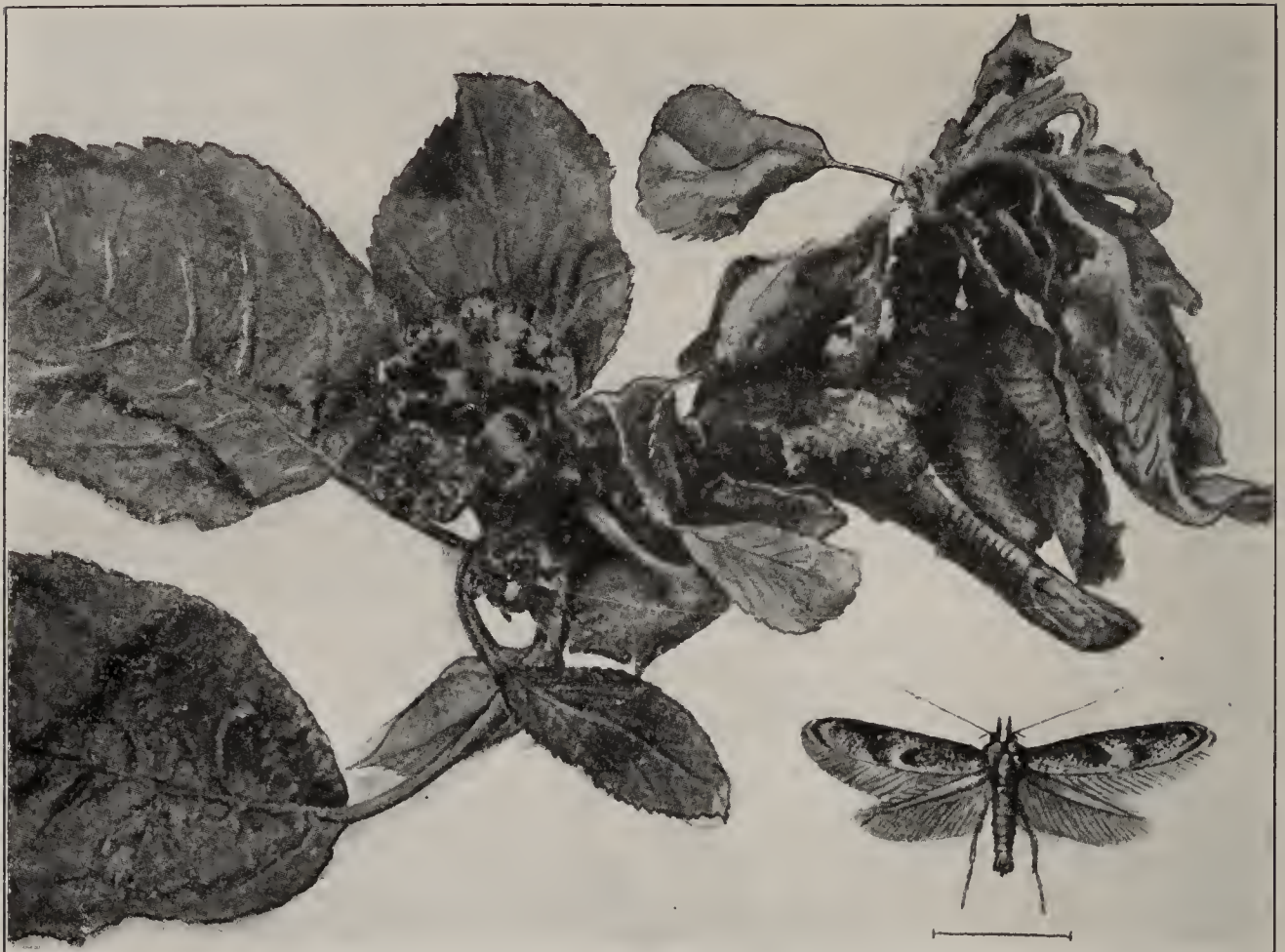
Distribution: Europe, Central Russia.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 153.

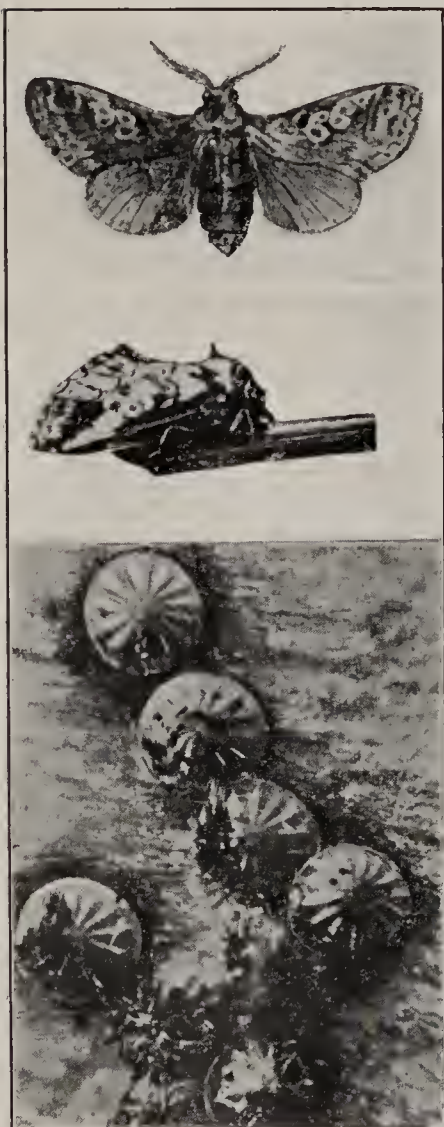


THE HARLEQUIN FRUIT BUG

The harlequin fruit bug (*Dindymus versicolor*): Adults, nymphs, and injury to apple. (French.)



1



2



3

APPLE MOTHS.

FIG. 1.—The apple pith moth (*Blastodacna hellerella*) and injury to twig and adult. FIG. 2.—The "figure-of-8 moth" (*Diloba caeruleocephala*). Dorsal and lateral views of adult, and eggs (Theobald). FIG. 3.—The apple moth (*Argyresthia conjugella*). Adult, and injury to apple. (Berettning.)



THE GREEN HANGING MOTH OF THE APPLE.

The green hanging moth of the apple (*Charagia lignivora*): Adults, pupa, and larva in twig showing sawdust swelling. (French.)

123

Dindymus versicolor H.-S.

(Harlequin Fruit Bug. Pyrrhocoridae; Hemiptera.)

Hosts: Apple.*Injury:* Disfigures apples by puncturing the skin in feeding.*Description and biology:* *Adult* about 12 mm. long, orange red, black, and yellow in color. *Nymphs* of both sexes, when about half grown, are more highly colored than when mature. *Eggs* are deposited in late summer among rubbish, crevices of old posts, etc., or even in stubble. The newly hatched nymphs on hot days occur in swarms on many kinds of plants, on fences, and among rubbish. (See plate vi.)*Distribution:* Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1891, pt. 1, p. 89.

Rhizopertha collaris Erichson.

(Apple-tree Borer. Bostrychidae; Coleoptera.)

Hosts: Apple.*Injury:* Regarded as serious pest.*Description and biology:* *Adult* length 4 to 6 mm. Adults bore into wood. *Larva* bores horizontal burrows into wood of trees; remains in tree after it is dead. *Eggs* are deposited in the holes bored in trees.*Distribution:* Australia, Tasmania.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1891, pt. 1, p. 61.

Phyllobius maculicornis Germar.

(Green Leaf Weevil. Brachyrhinidae; Coleoptera.)

Hosts: Apple, pear, cherry, plum, nuts, oak, hawthorn, sloe, maple.*Injury:* Injury frequent. Attack young buds and leaves.*Description and biology:* *Adult* length 12 mm.; brown; clothed with green or greenish scales; slightly hairy; antennae reddish, with black, clublike apices; legs black and brown. Occurs throughout May and June. *Pupates* in spring. *Larva* white, footless, curved, slightly hairy, with brown hairy head. Feeds on roots of various plants. Winters as larva. *Eggs* deposited in ground.*Distribution:* Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 119.

Leptops hopel Schönherr.

(Apple-root Borer. Curculionidae; Coleoptera.)

Hosts: Apple, pear, cherry.*Injury:* Very serious injury. Attacks roots.*Description and biology:* *Adult* length 25 mm.; light grayish brown. Occurs just before buds begin to swell. Disappears in December (Victoria). *Pupates* in ground. *Larva* length 25 mm.; whitish; tunnels roots of trees. *Eggs* deposited on upper sides of leaves, which have their edges glued together, hiding the eggs. Deposited in masses of 40 to 50. (See text fig. 7b.)*Distribution:* Victoria.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1891, pt. 1, p. 71.

Magdalis barbicornis Latreille.

(Apple-stem Piercer. Curculionidae; Coleoptera.)

Hosts: Apple, quince, and medlar trees.*Injury:* To twigs.*Description and biology:* *Adult* length 2-2.5 mm.; black; neck-shield without knobs on sides; very thickly punctate, elytra strigose-punctate, the space between punctations ridged. Occurs in June. *Pupates* in gallery in twig under bark. *Larva* burrows in twig, by preference in bark, to the sapwood which is only slightly attacked; the bark becomes reddish-brown and sinks away.

Distribution: Europe.

HENSCHEL, G. A. O. *Die Schädlichen Forst- und Obstbaum-Insekten*, 1895, p. 94.



FIG. 7.—Work of apple weevils: *a*, Apple buds injured by *Anthonomus pomorum* (Henschel); *b*, apple root tunneled by *Leptops hopei* (French).

Anthonomus pomorum Linnæus.

(Apple-blossom Weevil. Curculionidæ; Coleoptera.)

Host: Apple, pear.

Injury: Often very destructive to apple. Larva injurious to buds and blossoms; adult feeds on leaves.

Description and biology: Adult length 3 to 4 mm.; pitch black or fuscous black, with ashy pubescence; most easily recognized by pale V-shaped mark on elytra. Appear in late spring and live until next spring, when they copulate and oviposit. Hibernate in rubbish. Pupa yellowish brown. Pupates in withered flower bud. Pupation lasts 7 to 10 days. Larva length 4–5 mm.; white, footless, head brown; feeds in flower bud. Larval stage 8 days to 3 weeks. Eggs deposited in blossom buds. A single female deposits 50 or 60 during a period of 2 weeks. (See text figs. 7a, 8.)

Distribution: Europe.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 104.



FIG. 8.—Apple bud weevil (*Anthonomus pomorum*). (Theobald.)

Cossus tristis Drury.

(Apple and Quince Borer. Cossidæ; Lepidoptera.)

Hosts: Apple, quince, pear.*Injury:* Bores in sapwood.

Description and biology: *Adult* occurs from September to November (South Africa). Broods may overlap. *Pupa* may be found in July and September. *Larva* length 50 mm.; wholly flesh-colored or mottled with red. Young larvæ feed first beneath the bark, older larvæ burrow in middle wood. *Eggs* deposited on bark, singly or in groups; especially in the fork of branches.

Distribution: South Africa.

LOUNSBURY, C. P. Rept. Gov. Entomologist for 1898.

Cape of Good Hope, Cape Town, 1899.

**Blastodacna putripennella** Zeller.

(Apple Pith Moth. Elachistidæ; Lepidoptera.)

Host: Apple.*Injury:* Not seriously destructive.

Description and biology: *Adult* forewing brownish gray with golden and whitish spots and stripes, head gray; eyes white; antennæ, gray ringed with white. Occurs in July and August (Germany). *Pupates* about end of June between dry leaves on dead twigs. *Larva* yellowish, with broad reddish segmental divisions; head, neck, anal shield, and feet dark brown; prolegs and a side stripe above the feet yellow. Hatches in autumn and feeds on leaves; on approach of winter bores into buds of 1-year-old twigs; in spring bores into pith of twig. *Eggs* are placed on leaves. (See text fig. 9.)

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 255, figs. 186, 187.

Blastodacna vinolentella H.-S.

(Pith Moth. Elachistidæ; Lepidoptera.)

Host: Apple.

Injury: Considerable injury. Larva burrows into buds, shoots, and spurs.

Description and biology: *Adult* wing expanse a little less than 12 mm. Forewings may be almost black or may be marked with dark brown and rusty brown; inner margin white to beyond middle, where an irregular faint white oblique bar proceeds to tip of wing; two branches from which intersect black apical portion; hind wings gray and fringed; head black. Occurs in July and August. *Pupa* ochraceous; head, front of thorax, and tip of body, mahogany red; cylindrical in form; length 6 mm. *Larva* length 8 mm. Dull reddish brown with deep brown head and first thoracic segment. Larvæ hatch in late summer, feed on leaves, bore into bud, pass the winter there, and mature in June. *Eggs* are unknown.

Distribution: England, Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 92.



FIG. 9.—Apple pith moth (*Blastodacna putripennella*): Adult and injured twig. (Sorauer.)

Blastodacna hellerella Dup.

(Pth Moth. Elachistidæ; Lepidoptera.)

This moth is similar to *B. vinolentella* in habits and description, except that head of adult is white. (See plate VII, fig. 1.)

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 92.

Chloroclystis rectangulata Linnaeus.

(Green Pug Moth. Geometridæ; Lepidoptera.)

Host: Apple.

Injury: Feeds on blossoms and young leaves. Not serious.

Description and biology: Adult wing expanse 18 mm.; forewings deep green with dark brown and gray bands; hind wings with similar greenish tinge. Flies in May, June, and July. Pupa thorax and wing cases yellow; caudal end deep red, tinged with olive. Larva pale yellowish green, with rusty red line down back; division between segments reddish; a line at sides yellowish green. Larvæ appear in early spring. Pupate in earthen cocoon on ground. Eggs deposited on trees in early summer, where they remain over winter.

Distribution: Europe, England.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 68.

Charaglia lignivora Lewin.

(Green Hanging Moth of the Apple. Hepialidæ; Lepidoptera.)

Hosts: Apple, acacia, aster, eucalyptus, etc.

Injury: Injuries confined largely to native trees; sometimes destructive to apple. Bores in wood.

Description and biology: Adult male forewings pea-green, with silvery white markings; hind wings pale green; female forewings darker green than those of male, with purplish bands; hind wings orange pink. Larva pale pink, yellow or purplish yellow, head dark-brown. A "swelling" sawdust covering covers burrow of larva. Eggs deposited on bark of tree. (See plate VIII.)

Distribution: Victoria.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1909, pt. 4, p. 77.

* **Argyresthia conjugella** Zeller.

(Apple Moth. Hyponomeutidæ; Lepidoptera.)

Hosts: Apple, cherry, plum, whortleberry, mountain ash, service berry.

Injury: Serious to fruit.

Description and biology: Moth with front wings violet gray, sprinkled with lighter, with yellowish white stripe on the inner margin, and a whitish spot near apex. Larva with black head, body at first whitish, later fleshy red with many dark brown setigerous spots; 7 mm. long. Breeds in fruits. Pupates outside of the fruit in cocoons. (See plate VII, fig. 3.)

Distribution: Europe, British Columbia, Japan.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 269-270, figs. 196-197.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 193.

Report No. 6, Hokaido Agric. Exp. Sta., Sapporo, Japan, March, 1916. Plates 1, 3.

**Hyponomeuta malinellus* Zeller. *H. padellus* Linnæus.

(Apple and Cherry Ermine Moths. Hyponomeutidæ; Lepidoptera.)

These two ermine moths, which are destructive fruit-tree pests, have recently been introduced into the United States, the one well treated in Technical Bulletin 24, of the Geneva, N. Y., Agricultural Experiment Station (1912), to which the reader is referred. (See text fig. 10.)

Diloba cæruleocephala Linnæus.

(Figure-of-8 Moth. Blue-head. Noctuidæ; Lepidoptera.)

Hosts: Apple, plum, cherry.

Injury: Seldom serious; defoliation.

Description and biology: *Adult* wing expanse of male less than 25 mm., female 30 mm.; forewing grayish brown and brown, with a pale spot shaped like a figure 8 on each wing; hind wing grayish brown with darker ray-like lines and a dark wedge-shaped patch at the hinder angle. Occurs in September and October (England). *Larva* over 25 mm. long; head blue with two small black dots; body color varied, yellowish green or bluish gray, with broken yellow line along side below spiracles; small black spots on segments. Larvæ appear when leaves expand and are ready to spin up in June; pupate in crevices in bark and on limbs of trees. *Eggs* usually laid singly on shoots and spurs of fruit trees; they are round, flattened below, gray or grayish brown in color. (See plate VII, fig. 2.)

Distribution: England, Europe, and Asia Minor.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 35.

Sesia myopæformis Bosk.

(The Apple Clearwing. Sesiidæ; Lepidoptera.)

Hosts: Apple, apricot.

Injury: Larvæ work under bark.

Description and biology: *Adult* wing expanse 22 to 25 mm.; head, thorax, and abdomen black; male abdomen has red band above and white beneath; female has only a white edge underneath, with tail-like fan of black scales; wings transparent with dark scaled areas. Day-flying moths; occur in May, June, and July. (England). *Pupa* pale brown, protected by silken cases covered with chips. *Larva* length 15 mm.; dull yellowish white, head reddish brown; second thoracic segment with brown dorsal shield. *Eggs* laid on tree trunk. (See text fig. 12.)

Distribution: Europe.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 17.



FIG. 10.—Apple ermine moth (*Hyponomeuta malinellus*) Eggs, larva, pupa, adult, and nest. (Henschel.)

***Tortrix ashworthana* Newman.**

(Light Brown Apple Moth. Tortricidæ; Lepidoptera.)

Hosts: Apple. (A. Busck states that this species feeds on Acacia only.)*Injury*: Very serious; attacks fruit in manner similar to codling moth.*Description and biology*: *Adult* female wing expanse, 18 mm.; forewings light brown, slightly barred. *Larva* light green in color, seldom penetrates apple as far as seeds. *Eggs* deposited in calyx.*Distribution*: Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1891, pt. I, p. 66.



FIG. 11.—The apple sawfly (*Hoplocampa testudinea*). Adult and injured apples. (Theobald.)

Hoplocampa testudinea Klug.

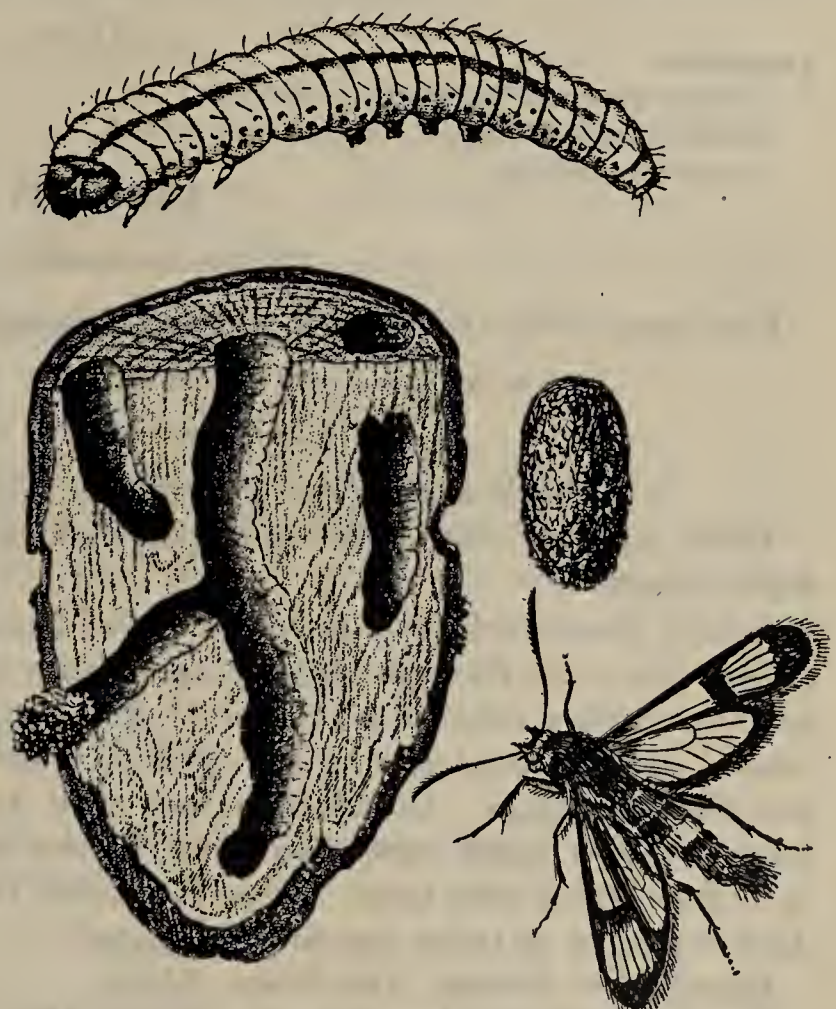
(Apple Sawfly. Tenthredinidæ; Hymenoptera.)

Host: Apple.*Injury:* Local. Damages fruit.

Description and biology: *Adult*, female, length 6–8 mm.; reddish yellow, with a black patch on the head, another on thorax and on dorsum of abdomen; head and mesothorax punctured; antennæ dusky in middle: male, slightly smaller. First brood occurs about apple-blossom time; second brood occurs in July. *Pupate* in soil. *Larva*, length 12 mm., creamy white; grub-like with brown head and a double, black chitinous plate on dorsum of anal segment; eats out cavities in interior of fruit. Many larvæ migrate from one apple to another. Larval period in first brood 4 or 5 weeks. Winters as larva in second brood. *Eggs* are deposited in blossom. This stage varies from 8 to 14 days. (See text fig. 11.)

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 122.

B. IMPORTANT APPLE INSECTS.**Coccidæ:****HEMIPTERA.****Armored—***Aspidiotus (Diaspidiotus) africanus* Marlatt; South Africa.*Diaspis pyri* Colvée; Spain, Belgium, Denmark, France, Italy, Croatia, Austria, Switzerland, Tyrol.**Epidiaspis piricola* Del Guercio; France, Russia, Italy. (See Pear.)**Leucaspis japonica* Cockerell; Japan.*Parlatoria affinis* Newstead; Algeria, Egypt.*Parlatoria calianthina* Berlese and Leonardi; Italy, Spain, Victoria, and New South Wales.**Parlatoria pyri* Marlatt; China; scale of female 1–1.25 mm. in length, oval; larval exuvia, purplish green, second exuvium dark olive, almost black. Apparently a dangerous pest.**Unarmored—***Coccus hoferi* King; Switzerland.**Lecanium bituberculatum* Targioni-Tozzetti; England, France, Sweden, Italy, Germany.*Lecanium capreæ* Linnæus; Europe, Nova Scotia.*Lecanium glandi* Kuwana; Japan.**Lecanium persicæ* Fabricius; Europe, Australia, Canada.*Lecanium pyri* Schrank; Europe, Prince Edwards Island.*Lecanium rugosum* Signoret; France, Germany.*Lecanium variegatum* Goethe; Europe.*Lecanium vini* Bouché; Europe.*Pseudococcus glaucus* Maskell; New Zealand.**Tingitidæ.***Stephanitis pyri* Fabricius; Europe. (See Pear.)**COLEOPTERA.****Cerambycidæ.***Cerambyx scopolii* Fuessly; Europe; borer.*Saperda scalaris* Linnæus; Europe; borer.*Liopus nebulosus* Linnæus; Europe; borer.**Curculionidæ.***Magdalis cerasi* Linnaeus and *M. pruni* Linnæus; Europe; breed under bark.*Anthonomus incurvus* Panzer, *A. pedicularius* Linnæus, and *A. pyri* Boheman; bud weevils; Europe.FIG. 12.—The apple clearwing (*Sesia myopæformis*). Moth, cocoon, larva, and borings. (Reichelt.)

Anthribidæ.

Doticus pestilans Oliff; Victoria; a pest of dried apples.

Scolytidæ.

Scolytus pruni Ratzeburg; Europe. (See Plum.)

Scolytus mali Bechst.; Europe; galleries in bark.

LEPIDOPTERA.

Pyralidæ.

Dichocrocis punctiferalis Guénée; Queensland. (See Corn.)

Lymantriidæ.

Teia anartoides Walker; Australia. (See Fruit.)

Lasiocampidæ.

Gastropacha quercifolia Linnæus; Europe. (See Fruit.)

Odonestis australasiæ Fabricius; Australia; defoliator.

Geometridæ.

Hibernia defoliaria Clerck; Europe. (See Forests.)

Anisopteryx æscularia Schiffermiller; Europe. (See Forests.)

Cheimatobia brumata Linnæus.

Elachistidæ.

Coleophora anatipennella Hübner; Europe. (See Plum.)

HYMENOPTERA.

Tenthredinidæ.

Hoplocampa fulvicornis Klug, sawfly; Europe; mines in fruit.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann. (See Fruit.)

Bactrocera tryoni Froggatt; Orient. (See Fruit.)

Bactrocera cucurbitæ.

APRICOT.

(*Prunus armeniaca*, etc.)

Fruit trees of the Orient, now widely cultivated.

A. AN APRICOT PEST LIKELY TO BE IMPORTED.

Capua angustiorana Haworth.

(Small Apricot and Vine Moth. Tortricidæ; Lepidoptera.)

Hosts: Apricot, vine, pear and a great variety of other trees. Attacks foliage and fruit clusters.

Injury: Does much harm to foliage of wall fruit.

Description and Biology: *Adult* wing expanse 12–18 mm.; female forewing reddish-ochreous, with a reddish brown basal patch forming an oblique streak and a reddish central spot; a costal spot is pale yellow; male wing grayish-ochreous with brown and black markings. Occurs from June until August. Pupation takes place among leaves. *Larva* length more than 12 mm.; color yellowish, or grayish green with pale spots from which arise hairs; occurs in greatest numbers in April and May; rolls leaf. *Eggs* deposited on twigs, hatching in spring.

Distribution: Europe, Asia Minor, Africa.

THEOBALD, F. V. *Insect Pests of Fruits*, 1909, p. 181.

B. IMPORTANT APRICOT INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Aspidiotus (Diaspidiotus) africanus Marlatt; South Africa.

**Epidiaspis piricola* Del Guercio; Germany, Italy, France, established in California.

Parlatoria calianthina Berlese and Leonardi; Italy.

Unarmored—

Lecanium coryli Linnæus; Europe.

Lecanium kunoensis Kuwana; China.

**Lecanium prunastri* Fonscolombe; Europe, Japan.

Lecanium vini Bouché; Europe.

COLEOPTERA.

Cerambycidae.

- Liopus nebulosus* Linnæus; Europe; borer.
Uracanthus acutus Blackburn; Australia. (See Peach.)

Scolytidae.

- Scolytus amygdali* Guérin; Europe. (See Almond.)

LEPIDOPTERA.

Sesiidae.

- Sesia myopaeformis* Bosk.; Europe. (See Apple.)

COLEOPTERA.

Geometridae.

- Lophodes sinistraria* Guérin; Australia; defoliator.

DIPTERA.

Trypetidae.

- Ceratitis capitata* Wiedemann, attacks *Prunus armeniaca*. (See Fruit.)
Bactrocera tryoni Froggatt; Orient. (See Fruit.)
Bactrocera cucurbitæ.

ARAUCARIA.

(Family Coniferæ.)

Small evergreen plants much used in horticulture.

IMPORTANT ARAUCARIA INSECTS.

HEMIPTERA.

Coccidae:

Unarmored—

- Ctenochiton araucariæ* Green; Australia.
Eriococcus araucariæ Maskell; Europe, Canary Islands, Brazil; *Araucaria excelsa*, *A. bidwillii*.
Eriococcus angulatus Froggatt; Australia; *Araucaria excelsa*.
Pseudococcus aurilanus Maskell; New Zealand, Australia, Auckland, Natal, Hawaiian Islands;
Araucaria excelsa.

ARBORVITÆ.

(*Thuya* spp. Family Juniperaceæ.)

Ornamental evergreen trees of North America, East and Central Asia. The wood is light and soft, brittle, and rather coarse grained, durable in the soil; much used for construction, cabinet making, and in cooperage. *T. occidentalis* contains a volatile oil used in medicine.

INSECTS INJURIOUS TO ARBORVITÆ.

HEMIPTERA.

Coccidae:

Armored—

- * *Chionaspis striata* Newstead; Egypt, Algeria, Arizona, California; attacks *Thuya africana*.
Diaspis visci Schrank; Europe; *Thuya occidentalis*.

Unarmored—

- Lecanium arion* Lindinger; Europe; *Thuya occidentalis*.

COLEOPTERA.

Scolytidae.

- Phlæosinus thujæ* Perris; Europe.

BIBLIOGRAPHY

- LINDINGER, L. Die Schildläuse (Coccidæ), 1912.
EICHHOFF, W., Europ. Borkenkäfer, 1881.

ASH.

(*Fraxinus* spp. Family Oleaceæ.)

Hardy ornamental trees growing in Europe, Asia, and America. These trees are important also for their timber. *F. ornus* exudes a manna. Certain Chinese species yield the Chinese white wax. The various species are generally readily transplanted

and hence will be found in nursery stock shipments. They are usually propagated from seed. As several species of insects breed in the seed, care must be taken about introducing seed for planting.

A. AN ASH PEST LIKELY TO BE IMPORTED.

Eriophyes fraxini Nalepa.

(Ash Gall Mite. Eriophyiidæ; Acarina.)

Host: Fraxinus excelsior, F. viridis.

Injury: Forms galls in flowers, fruit, and leaves. (See text fig. 13.)

Description and biology: Four-legged blister mite which causes galls by its feeding. Liable to introduction on nursery stock.

Distribution: Europe, Mexico.

SORAUER, P.: Handbuch der Pflanzenkrankheiten, 3d ed., vol. 3, 1913, pp. 127, 128.

B. OTHER IMPORTANT ASH INSECTS.

HEMIPTERA.

Aphididæ.

Prociphilus bumeliae Schranck, a gall-making louse of Europe, which attacks the tender leaves and petioles of ash and on its intermediate host, the fir, breeds at the roots. The form on fir roots has been known as *Holzneria poschingeri* Holzner.

Coccidæ.

Armored—

Aspidiotus (Chrysomphalus) nigropunctatus Cockerell; Mexico.



FIG. 13.—Ash gall mite (*Eriophyes fraxini*): Gall formations on twigs of *Fraxinus excelsior*. (Gillanders.)

Chionaspis salicis Linnaeus, the willow scale; Europe; attacks *Fraxinus excelsior* and many other trees. *Parlatoria affinis* Newstead; Algeria; attacks *Fraxinus oxyphylla* and olive.

Unarmored—

Fonscolombia fraxini Kaltenbach; Europe; attacks *Fraxinus excelsior*.

ORTHOPTERA.

Oedipodidæ.

Pachytylus migratorius Linnaeus, the migratory locust; Europe; injures many plants.

COLEOPTERA.

Cantharidæ (Meloidæ).

Lytta vesicatoria Linnaeus, the Spanish fly; all Europe; very injurious as adult.

Cerambycidæ.

Cerambyx cerdo Linnaeus, the great oak borer; Europe; bores in wood. (See Oak.)

Scarabæidæ.

Melolontha hippocastani Fabricius, a May beetle; Europe; injures the roots of seedlings of various trees.

Melolontha melolontha Linnaeus, a May beetle; Europe; injures the roots of seedlings, and the adults attack the foliage.

Curculionidæ.

Cionus fraxini De Geer, a small oval weevil; Europe; breeds externally on the leaves of ash and olive, pupates in cocoons on the leaf.

Scolytoidea.

Hylesinus crenatus Fabricius, a bark beetle; Russia, Germany; bores the bark of ash and oak.

Hylesinus fraxini Panzer, a bark beetle; Europe; bores the branches and tops, attacking bark of ash, olive, and acacia.

Hylesinus oleiperda Fabricius, a bark beetle; Europe; attacks ash and olive.

Phlæotribus caucasicus Reitter; a bark beetle; Russia; attacks young portions of the trees.

**Scolytochelus multistriatus* Marsh., a bark beetle; Europe; attacks bast and sapwood of trees.

Scolytus scolytus Fabricius, a bark beetle; Europe; attacks bark, bast, and sapwood.

LEPIDOPTERA.**Cossidæ.**

Cossus cossus Linnaeus, a goat moth; Europe; bores in the wood. (See Willow.)

**Zeuzera pyrina* Linnaeus, a wood borer of Europe, Africa, North America. (See Horse-chestnut.)

Sesiidæ.

Sesia sphecoformis Grng., a clear-winged moth; Europe; bores in the wood.

Tortricidæ.

Tortrix podana Sc., a grass-green larva, which occasionally attacks ash; Europe.

Hyponomeutidæ.

Prays curtisellus Don., a small moth; Europe; larva mines leaves, skeletonizes, webs leaves, or mines buds, in its different generations.

Gracillariidæ.

Gracillaria syringella Fabricius, a yellowish olive-brown moth; Europe (Sweden); larvæ first mine the leaves and then roll them; attack also *Syringa*.



FIG. 14.—Asparagus beetle (*Crioceris asparagi*): a, Adult; b, egg; c, young larva; d, full grown larva; e, pupa. (Chittenden.)

HYMENOPTERA.**Tenthredinidæ.**

Macrophya punctum-album Linnæus, a saw-fly; England; very injurious.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., vol. 3, 1913.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde 2d ed., 1913.

ASPARAGUS.

(*Asparagus officinalis* Linnæus. Family Liliaceæ.)

Various other species of asparagus are cultivated for decorative purposes. The above-mentioned species is useful both for its delicious edible shoots and its graceful foliage. Pests introduced on any type of asparagus are likely to attack the cultivated crop.

A. BETTER KNOWN ASPARAGUS INSECTS LIKELY TO BE IMPORTED.

Crioceris spp.

(Asparagus Leaf Beetles. Chrysomelidæ; Coleoptera.)

Species: **C. asparagi* Linnæus; Europe, introduced into North America and widely distributed; asparagus. (See text fig. 14) A very important pest. **C. 12-punctata* Linnæus; Europe, introduced into North America and widely distributed; aspara-

gus. (See text fig. 15.) A very important pest. *C. merdigera* Linnæus; Europe; onion, leek, garlic, lily of the valley, asparagus.

Injury: Feed on the stems of the asparagus and cause much injury, amounting often to thousands of dollars.

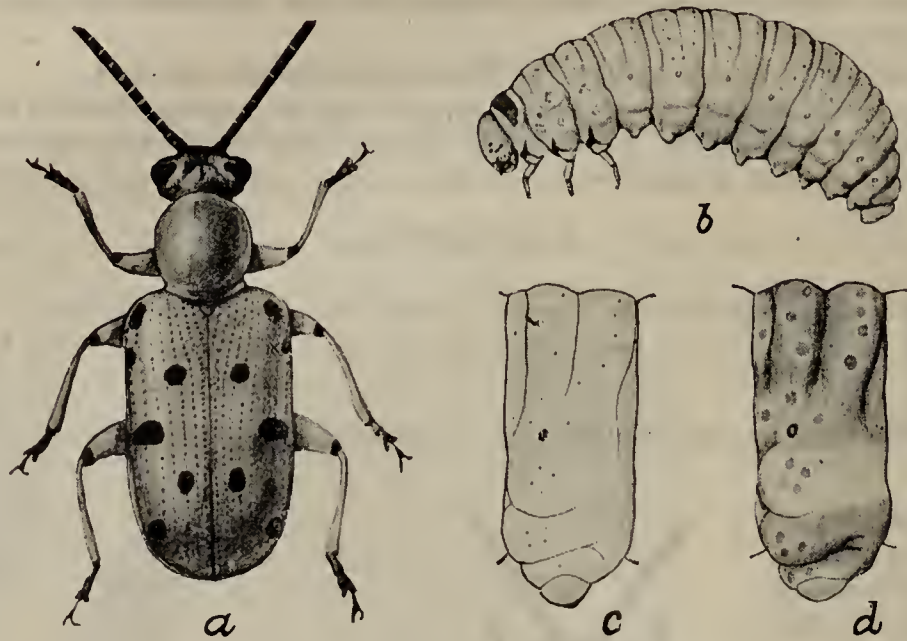


FIG. 15.—Asparagus beetle (*Crioceris duodecimpunctata*): a, Adult; b, larva; c, d, details of larval structure. (Chittenden.)

Biology: Eggs laid on plant. Larva feeds on stems and foliage. Pupates in soil. Two broods per annum.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., vol. 3, 1913, p. 510.

CHITTENDEN, F. H. U. S. Dept. Agr., Bur. Entomology, circ. 102, 1908, 12 pp., 6 figs.



FIG. 16.—Asparagus miner (*Agromyza simplex*): Adults. (Chittenden.)

Agromyza maura Meigen. * *Agromyza simplex* Loew.

(Asparagus Miners. Agromyzidæ; Diptera.)

Hosts: Asparagus.

Injury: Mine immediately under the bark of the asparagus stem. The latter species has been introduced into the United States.

Description and biology: Adult fly very small. Larva white, legless. Pupates in mine. (See text figs. 16, 17.)

Distribution: *A. maura*; Hungary. *A. simplex*; Europe, North America.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, p. 406, 407, fig. 252.

CHITTENDEN, F. H. U. S. Dept. Agr., Bur. Ent., bull. 66, pt. I, 1907, pp. 1-5, 2 figs.

Platyparæa pœcilloptera Schrank.

(Asparagus Fly. Trypetidæ; Diptera.)

Hosts: Asparagus.

Injury: Mines the stems.

Description and biology: Fly dark brown, abdominal segments banded whitish; face, legs, and antennæ reddish yellow; wings clear with a dark zigzag longitudinal band; length 6-8 mm. Maggot whitish, apical stigmatal plates shining black with two forward turned hooks; length 10 mm.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., vol. 3, 1913, p. 421-422.

B. OTHER IMPORTANT ASPARAGUS PESTS.

HEMIPTERA.

Coccidæ:

Armored—

Chionaspis berlesei Leonardi; Europe; attacks *Asparagus acutifolius* and *A. umbellatus*.

COLEOPTERA.

Brachyrhinidæ.

Cneorhinus plagiatus Schall.; a weevil, causes serious injury in England.

LEPIDOPTERA.

Noctuidæ.

Mamestra oleracea Linnæus; Europe; larvæ feed on plants. (See Cabbage.)

DIPTERA.

Anthomyiidæ.

Chortophila cilicrura Rondani; Europe; breeds in stems. (See Onion.)

ASSAM RUBBER.

(*Ficus elastica*. Family Urticacæ.)

Assam or India rubber is a native of Assam and the Malay region. It can be grown from cuttings or seed. As it belongs to the same genus of plants as the fig, its insects are treated under the discussion of that plant. (See Fig.)

ASPEN.

(*Populus tremula*. Family Salicacæ.)

See Poplar.

AVOCADO; ALLIGATOR PEAR.

(*Persea gratissima*, etc. Family Lauracæ.)

This tropical American species is much prized for its large edible fruit, and is now cultivated extensively in Florida and southern California. Several other species of the genus are prized by the American trade for their evergreen foliage.

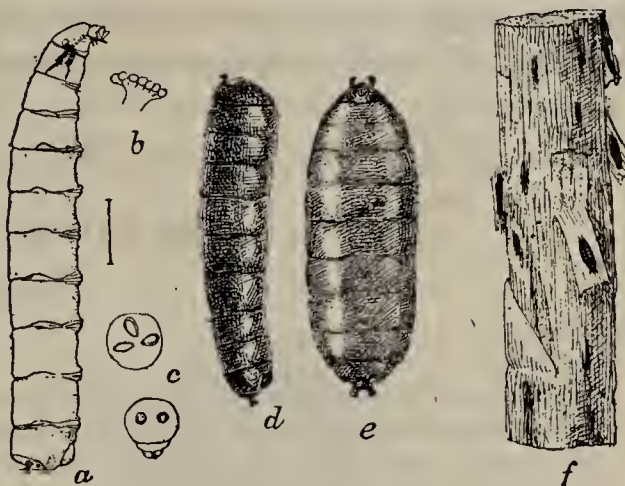


FIG. 17.—Asparagus miner (*Agromyza simplex*): a, Larva; b, c, larval details; d, e, puparium; f, injury. (Chittenden.)

A. AN AVOCADO PEST LIKELY TO BE IMPORTED

Hellipus lauri Boheman.

(Avocado Weevil. Curculionidæ; Coleoptera.)

Host: Fruit of *Persea persea* L. (*Laurus drymifolia*) and *Persea pittieri* Mez.*Injury*: Larvæ make galleries in the seed. Likely to be introduced in seed and fruit. Live specimens have been received in the United States.*Description*: Adult weevil of a red ground color, with red femora, or dark brown with unicolorous legs and prominent patches of white scales; rostrum long, prothorax conical. The larvæ breed in the seed and their presence is not easily detected. In the case of the recent introductions the seeds were planted and the injury was not noticed until faulty germination caused an examination.*Distribution*: Mexico, Costa Rica. (See plate XLIX.)

BARBER, H. S. Proc. Ent. Soc. Wash., vol. 14, 1912, pp. 181-183, plate 9.

B. OTHER IMPORTANT AVOCADO INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Aspidiotus (Pseudaonidia) articulatus Morgan; Mexico (See Coffee). Scale of adult female 1 mm. in diameter, circular, reddish brown with central portion blackish, exuvia covered.* *Aspidiotus (Chrysomphalus) perseæ* Comstock; Mexico.*Aspidiotus persearum* Cockerell; Hawaii; on *Persea gratissima*. Scale of female 1.25 mm. long, 1 mm. broad brownish cream color, exuvia sublateral.*Aspidiotus (Chrysomphalus) personatus* Comstock; West Indies, Mexico; *Persea americana*. (See Olive.)*Aspidiotus (Chrysomphalus) scutiformis* Cockerell; Mexico, Central America. (See Citrus.)*Lepidosaphes longula* Leonardi; Java; scale of female about 2.35 mm. long, elongate, curved, narrow, coffee colored.*Pinnaspis rhombica* Leonardi; Java; scale of adult female 1 mm. long, rhomboid, castaneous brown.*Pseudoparlatoria parlatorioides* Comstock; Brazil, Mexico; on *Persea carolinensis*. Scale of adult female about 1.4 mm. in diameter, light yellow, exuvia very large, extending from center of scale to margin, having the appearance of a *Parlatoria*.

Unarmored—

Ceroplastes cistudiformis Townsend and Cockerell; Mexico; wax scale. Adult female covered with dirty gray wax which is marked into plates; 6-8 mm. in length and 4.5 to 5.5 mm. in width.*Ceroplastes rubens* Maskell; Australia, India, Ceylon, Hawaii. Adult female 2.2-6 mm. in length, covered with wax which is rather thick and dull red or pinkish throughout.*Icerya montserratensis* Riley and Howard; Mexico. (See Citrus.)*Pseudococcus virgatus* Cockerell; Isle of Pines.*Pulvinaria mammeæ* Maskell; Hawaii, Natal; on *Persea persea*. Adult female reddish brown covered with a thin grayish meal, ovisac large, snow white, irregular, forming a mass of loose cotton.*Pulvinaria simulans* Cockerell; Mexico.

LEPIDOPTERA.

Lasiocampidæ.

Suana concolor Walker; Java, defoliator.

Cossidæ.

Zeuzera coffeæ Nietner; India, Ceylon, Java, East Africa, Kamerun. (See Coffee.)

COLEOPTERA.

Bostrychidæ.

Apate monachus Fabricius; Africa, West Indies. (See Citrus.)

Brachyrhinidæ.

Diaprepes abbreviatus Linnæus; West Indies. (See Sugar cane.)

Calandridæ.

* *Caulophilus latinasus* Say; Florida, probably imported; bores in seed.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann; attacks *Persea persea*. (See Fruit.)

BAMBOO.

(*Bambusa* spp.; *Dendrocalamus strictus*, etc.; *Arundinaria* spp.; *Cephalostachyum pergracile*; *Melocanna bambusoides*; *Phyllostachys* spp. Family Bambuseæ.)
Treelike grasses much used in cultivation.

A. BETTER KNOWN BAMBOO INSECTS LIKELY TO BE IMPORTED.

Dinoderus minutus Fabr.

(Smaller Bamboo Shot-hole Borer. Bostrychidæ; Coleoptera.)

Hosts: Bamboo (*Dendrocalamus strictus* and *Bambusa*).

Injury: Commonly found attacking bamboos and is also found in cut sugar cane.

Description and biology: Beetle brown, shining, 2.5 mm. long, with black head and thorax, the bases of elytra lighter colored, occasionally almost reddish. Larva pale

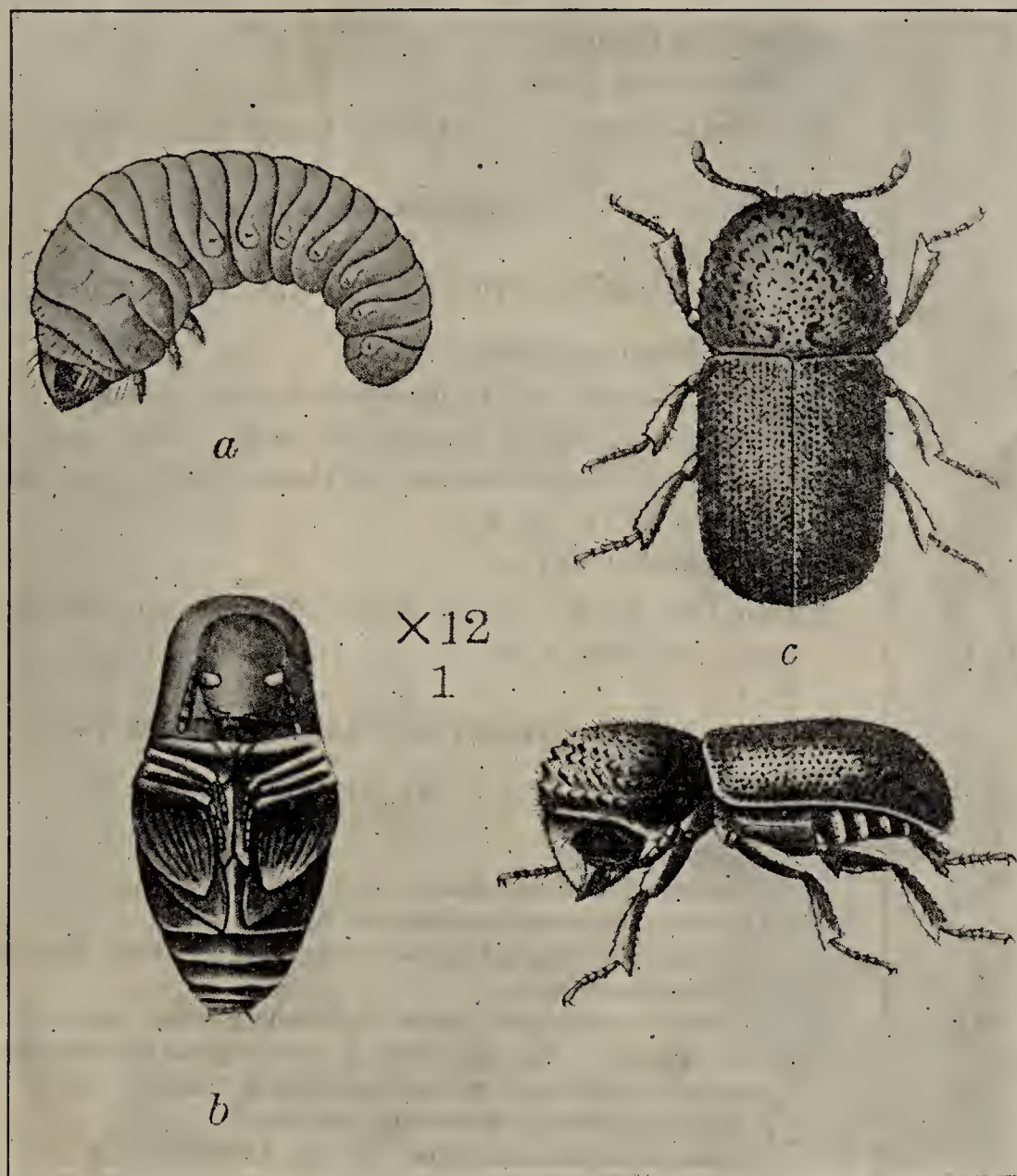


FIG. 18.—Smaller bamboo shot-hole borer (*Dinoderus minutus*): a, Larva; b, pupa; c, adults. (Stebbing.)

canary yellow, opaque, curved; head small orange brown with black mandibles; legs three-jointed. Length 3 mm. Bores in the bamboos. (See text figs. 18, 19.)

Distribution: India.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914, pp. 133–143, pl. 9.

Dinoderus pillifrons Lesne.

(Bamboo Shot-hole Borer. Bostrychidæ; Coleoptera.)

Hosts: Bamboo (*Dendrocalamus strictus*), various kinds of wood.

Injury: Bores in bamboos.

Description and biology: Adult reddish brown, 3.3 mm. long, appendages and lateral edges of abdomen lighter colored. Larva yellowish white, mouth parts brownish, mandibles black; length 3.2 mm. Pupa with yellow abdomen, wings white, head and prothorax dirty white.

Distribution: India.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914, pp. 130-133, fig. 89, pl. 131.

Eucosoma paragramma Meyrick.

(Bamboo Borer. Tortricidae; Lepidoptera.)

Host: Bamboo.

Biology: Caterpillar bores in the stem of green bamboo, pupates in tunnel.

Distribution: India.

MAXWELL-LEFROY, H. Indian Insect Life, 1909, p. 530.

Ceratitis striata Froggatt.

(Bamboo Fruit Fly. Trypetidae; Diptera.)

Host: Bamboo shoots.

Injury: Larvæ feed in decayed shoots of bamboo.

Description: Adult length 5-6 mm., color pale yellow to grayish with upper surface of thorax variegated with black. (See plate xxvi, fig. a.)

Distribution: Ceylon.

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bull. 24, 1909, p. 51.

B. IMPORTANT BAMBOO INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Aspidiotus (Odonaspis) bambusarum Cockerell; Japan.

Aspidiotus (Odonaspis) canaliculata Green; Ceylon.

Aspidiotus (Odonaspis) inusitata Green; Japan, Ceylon; *Arundinaria*, *Phyllostachys bambusoides*.

**Aspidiotus (Odonaspis) secreta* Cockerell; Hawaii, Japan; *Bambusa* and *Arundinaria*. Has been taken in quarantine at San Francisco.

Aspidiotus (Odonaspis) secreta saccharicaulis Zehntner; Java.

Aulacaspis javanensis Newstead; East Java.

Chionaspis arundinariae Green; Ceylon; *Arundinaria*.

Chionaspis bambusæ Cockerell; Japan.

Chionaspis colemani Kuwana; Japan; *Phyllostachys bambusoides*.

Chionaspis elongata Green; Ceylon.

Chionaspis graminis Green; Ceylon, Japan. (See Pl. II, fig. 1.)

Chionaspis hikosani Kuwana; Japan; *Phyllostachys bambusoides*.

Chionaspis simplex Green; Ceylon.

Fiorinia bambusæ Maskell; Hongkong, China; *Bambusa fortunei*.

Fiorinia diaspidiformis Newstead; Java.

Fiorinia signata Maskell; Japan; *Bambusa tessellata*.

Fiorinia tenuis Maskell; Japan; *Bambusa*.

Hemichionaspis scrobicularum Green; Ceylon.

Lepidosaphes bambusicola Cockerell; Brazil.

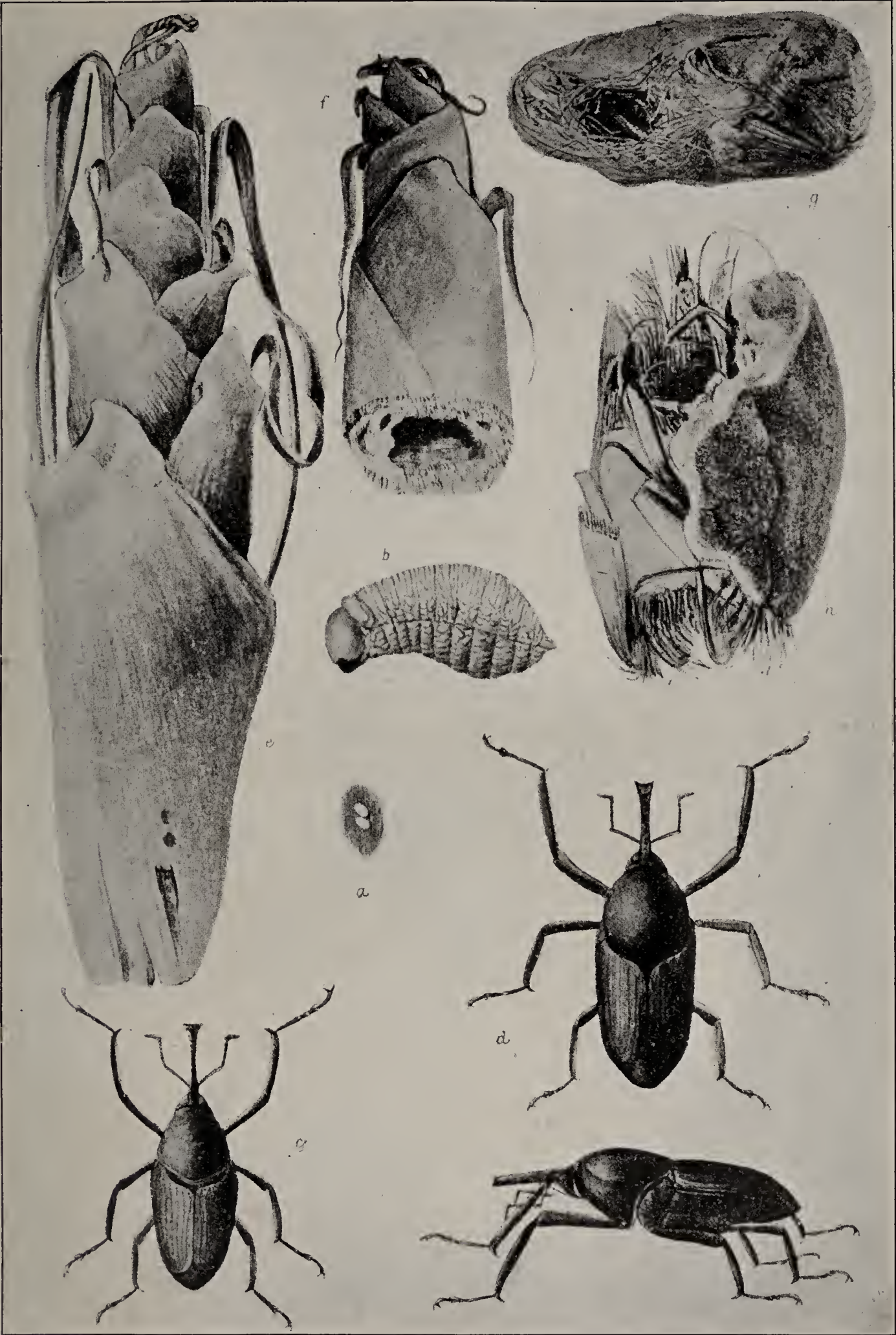
Leucaspis bambusæ Kuwana; Japan; *Phyllostachys*.

**Leucaspis japonica* Cockerell; Japan.

Pinnaspis bambusæ Cockerell; Jamaica.

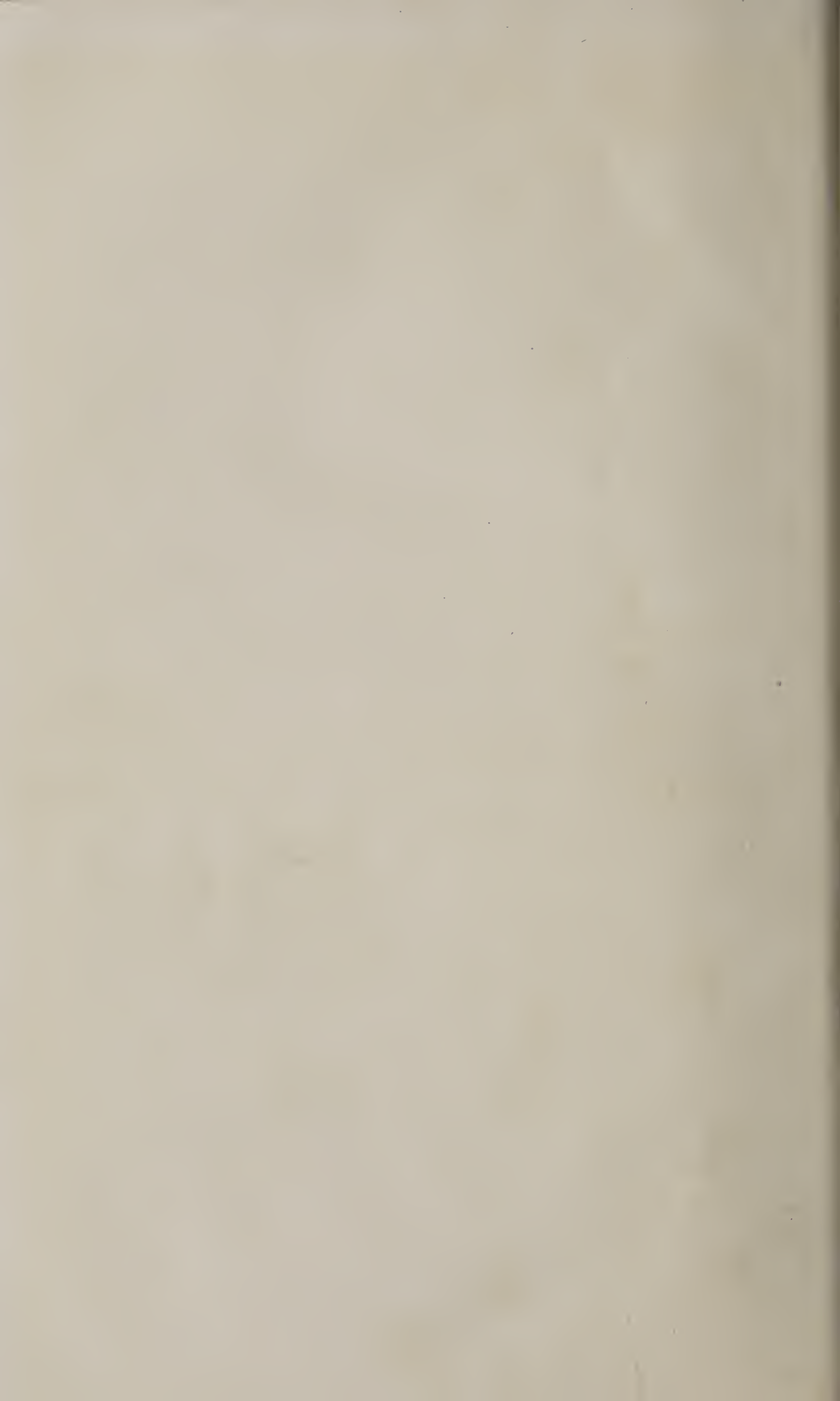


FIG. 19.—*Dinoderus minutus*. Injury to bamboo stalks. (Stebbing.)



THE BAMBOO BORER.

The bamboo borer (*Cyrtotrachelus longipes*): Adults ,eggs, larva, cocoon, injury. (Stebbing.)



Coccidæ—Continued.**Unarmored—**

- Aclerda distorta* Green; Ceylon.
Aclerda japonica Cockerell; England (in greenhouses); *Arundinaria japonica*.
Aclerda tokionis Cockerell; Japan; *Bambusa*.
Antonina socialis Newstead; England (in greenhouses); *Arundinaria japonica*.
 **Antonina crawii* Cockerell; Japan; California; New Jersey.
 **Asterolecanium bambusæ* Boisduval; Guatemala; Florida; *Bambusa viridis*, *Bambusa viridi-striata*.
Asterolecanium coronatum Green; Ceylon; *Dendrocalamus giganteus*.
Asterolecanium solenophoroides Green; Ceylon.
Asterolecanium exiguum Green; Ceylon, Hawaiian Islands.
Asterolecanium flavociliatum Green; Ceylon; *Arundinaria*.
Asterolecanium lanceolatum Green; Ceylon; *Arundinaria*.
Asterolecanium miliaris Boisduval; Ceylon, Cuba, Algeria, Mauritius, Brazil, Jamaica, Trinidad;
Bambusa vulgaris, *B. distorta*, *B. oliveriana*.
Asterolecanium pudibundum Green; Ceylon.
Asterolecanium rubrocomatum Green; Ceylon.
Asterolecanium tenuissimum Green; Ceylon.
Asterolecanium tumidum Green; Ceylon.
Asterolecanium udagamæ Green; Ceylon.
Asterolecanium bambusicola Kuwana; Japan.
Asterolecanium hemisphaericum Kuwana; Japan.
Asterolecanium masuii Kuwana; Japan.
Ceroplastes theobromæ Newstead; Cameroon.
 **Chætococcus bambusæ* Maskell; Hawaii, Ceylon, India, Mauritius, Brazil; *Bambusa tulda*.
Coccus arundinaris Green; Ceylon; *Arundinaria*.
Eriococcus graminis Maskell; China, Japan.
Eriococcus onukii Kuwana; China, Japan; *Arundinaria hindsii* var. *graminæ*.

Pentatomidæ.

- Ocropara montana*, a sucking bug; India; feeds in all stages on the seeds of bamboo (*Dendrocalamus strictus*).

COLEOPTERA.**Bostrychidæ.**

- Bostrychopsis parallela*; India; bores in wood of *Dendrocalamus strictus*.
 **Dinoderus brevis* Horn, India; United States; very important borers in the stalks of *Dendrocalamus strictus*.
Heterobostrychus unicornis Waterhouse; *Sinoxylon anale* Lesne; bores in bamboos of *Dendrocalamus strictus*.
Dinoderus distinctus Lesne; India; bores bamboos. (See Mango.)

Lyctidæ.

- Lyctus spinifrons* Lesne; India; bores in bamboos of *Dendrocalamus strictus*.

Cucujidæ.

- Psammæcus trimaculatus* Motschulsky; India; bores in wood of *Dendrocalamus strictus*.

Tenebrionidæ.

- **Tribolium confusum* Duval, and *T. castaneum* Herbst; India; bore in wood of *Dendrocalamus strictus*.

Chrysomelidæ.

- Estigmena chinensis* Hope; India; bores in young stems of *Dendrocalamus strictus* and *Cephalostachyum pergracile*.

Cerambycidæ.

- Stromatium barbatum* Fabricius; India; bores in *Dendrocalamus strictus*.

Curculionidæ.

- Cyrtotrachelus dux* Boheman; India; bores in tops and shoots of *Dendrocalamus hamiltoni*.
Cyrtotrachelus longipes Fabricius; India; bores in *Melocanna bambusioides*. (See plate ix.)

Cossonidæ.

- Conarthrus affinis* Wollaston; India; bores in bamboos of *Dendrocalamus strictus*.

LITERATURE.

- STEBBING, E. P. A Manual of Forest Zoology for India, 1908.
 STEBBING, E. P. Indian Forest Insects, 1914.

BANANA; PLANTAIN.

(*Musa* spp. (especially *paradisiaca*). Family Musaceæ.)

Bananas and plantain have become a very important article of commerce, being mainly imported from the West Indies and Central America. Since the plant can

only be propagated from suckers or sprouts there is danger of introducing pests into the country in this manner. The banana is grown very extensively in the Southern States as a hedge plant. The compact nature of the fruit bunches makes it possible for many insects of considerable size to find entrance into the country in the bunches as well as in the fruit itself.

A. BETTER KNOWN BANANA PESTS LIKELY TO BE IMPORTED.

Cosmopolites sordidus Germar (*Sphenophorus*.)

(Banana Root Borer. Calandridæ; Coleoptera.)

Hosts: Banana (all varieties), sugar cane.

Injury: Serious pest to young banana plants in Fiji.

Description and biology: *Adult* 14 mm. in length, 4 mm. in breadth, color dark brown to black, head with prominent rostrum, antennæ elbowed. *Pupa* soft and white when newly formed. Pupal stage lasts from 6 to 8 days in the bulb. *Larva* 20 mm. in length, 8 mm. in breadth, cream colored, footless, and requires about 20 days to reach pupal stage. *Eggs* presumably deposited singly on base of stem near the crown. The larvæ, upon hatching, work their way inward and down toward the bulb.

Distribution: Fiji, British New Guinea. [In eastern hemisphere South Pacific Ocean to Indian Archipelago.] Jamaica, India, Brazil.

JEPSON, FRANK P. Dept. Agric. Fiji, Rept. Econ. Entom., Council Paper No. 25, 1911, p. 48, fig.

Dacus curvipennis Froggatt.

(Banana Fruit Fly. Trypetidæ; Diptera.)

Host: Banana.

Injury: Breeds in fruit.

Description: *Adult* about 6 mm. long; head yellow; thorax with elongate bar of silvery white; legs yellow; tarsi and hind femora darker; abdomen elongate with base and two narrow transverse black bands below, sheath and ovipositor elongate. (See plate xxviii, figs. b, d.)

Distribution: Fiji.

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bul. 24, 1909, p. 28.

B. OTHER IMPORTANT BANANA INSECTS.

HEMIPTERA.

Aleyrodidæ.

Aleurodicus cocois Curtis; West Indies, Mexico, Central and South America. (See Cocoanut.)

Coccidæ.

Pseudococcus grassi Leonardi; Italy.

COLEOPTERA.

Calandridæ.

Rhabdocnemis obscurus Boisduval. (See Sugar cane.)

LEPIDOPTERA.

Pyralidæ.

Dichocrocis punctiferalis Guénée; Queensland. (See Corn.)

Castnildæ.

Castnia licus Drury; South America. (See Sugar cane.)

Tineidæ.

Ereunetis flavistriata Walsingham; Hawaii. (See Sugar cane.)

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann. (See Fruit.)

Rioxa musae Froggatt; Australia. (See Fruit.)

Bactrocera tryoni Froggatt; Orient. (See Fruit.)

BARLEY.

(*Hordeum vulgare*. Family Gramineæ.)

Barley is a grain with many varieties grown in various parts of the world, especially Europe and Asia. There is danger of importing pests of the grain only, unless the straw should be used for packing. Its pests are discussed under Grains and Grasses.

BAY.

(*Laurus* spp. Family Lauraceæ.)

Evergreen plants much cultivated for their shrubbery.

INSECTS ATTACKING BAY TREES.**HEMIPTERA.****Coccidæ:**

Armored—

**Aspidiotus britannicus* Newstead; Europe.

Aspidiotus (*Aonidia*) *lauri* Bouché; Germany, Australia, Greece, Italy, Spain, Portugal; *Laurus canariensis*.

Aspidiotus (*Chrysomphalus*) *paulistus* Hempel; Brazil.

Aspidiotus (*Chrysomphalus*) *scutiformis* Cockerell; Mexico, Central America.

Cryptaspidiotus aonidioides Lindinger; Canary Islands; *Laurus canariensis*.

Parlatoria calianthina Berlese & Leonardi; Italy.

Unarmored—

Coccus acuminatus Signoret; Hawaii, Ceylon, France.

Eucalymnatus brunfelsiæ Hempel; Brazil; *Laurus camphora*.

Icerya montserratensis Riley & Howard; West Indies, Mexico; *Laurus camphora*.

Paralecanium geometricum Green; Ceylon, China; *Laurus canariensis*.

Platinglisia noacki Cockerell; Brazil.

Pseudococcus indicus Signoret; France; *Laurus indicus*.

Pseudococcus laurinus Boisduval; France; *Laurus nobilis*.

Pulvinaria plana Lindinger; Canary Islands; *Laurus canariensis*.

BEAN.

(*Phaseolus vulgaris*. Family Leguminosæ.)

This species includes the kidney, common field, garden, snap, and string beans. It is probably of tropical American origin. The beans are an article of commerce and very likely to introduce pests.

BROAD BEAN.

(*Vicia faba*. Family Leguminosæ.)

The broad bean is a native of Asia, but is grown extensively in Europe and North America, especially as a food for domestic animals and for human consumption. The beans are an article of commerce and quite likely to introduce pests.

LIMA BEAN.

(*Phaseolus lunatus*. Family Leguminosæ.)

The lima or sugar beans are native to South America. They are articles of commerce and quite likely to introduce pests.

A. BETTER KNOWN BEAN INSECTS LIKELY TO BE IMPORTED.

Mylabris (*Bruchus*) spp., etc.

(Bean and Pea Weevils. *Mylabridæ* [*Bruchidæ*]. Coleoptera.)

Many of the weevils attacking beans are cosmopolitan and have been introduced into the United States. The fact that they breed in perfectly dry stored beans makes their distribution very easy.

Species: *M. loti* Paykull; seed of *Lotus* and *Lathyrus*. *M. atomarius* Linnaeus; very common; *Vicia faba*, *Lathyrus*, *Vicia sepum*, etc. **M. rufimanus* Boheman; Europe, North Africa, Egypt, Persia, Syria, introduced into California; beans, peas.

An important pest. *M. affinis* Frölich; France, imported into Ireland and East Indies; beans. **M. pisorum* Linnaeus; distributed from Orient until now cosmopolitan; a very serious pest; peas. *Vicia*, *Cytisus laburnum*. (See text fig. 20.) *M. lentis* Frölich; Europe, Egypt, Syria, lentils. *M. pallidicornis* Boheman; lentils. **Acanthoscelides obtectus* Say; now cosmopolitan; peas, cowpeas, lentils, beans. (See text fig. 21.) **Pachy-*



FIG. 20.—The pea weevil (*Mylabris pisorum*): a, Beetle; b, larva; c, pupa. Enlarged. (Chittenden.)

merus chinensis Linnaeus; now almost cosmopolitan; cowpeas, *Phaseolus radiatus*, *Cajanus indicus*, peas, lentils, beans, *Dolichos*, sorghum. (See text fig. 22.) **P. quadrimaculatus* Fabricius; now almost cosmopolitan; cowpeas, peas, beans. (See text fig. 23.)

Description: These weevils are small, somewhat flattened, rounded or oblong, with head concealed beneath. The larvæ breed in the seed of beans and peas and pupate there.

SORAUER, P.: Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 535-537.
CHITTENDEN, F. H.: U. S. Dept. Agric., Yearbook 1898, pp. 233-260.

Spermophagus pectoralis Sharp.

(Mexican bean weevil. Mylabridæ; Coleoptera.)

Host: Beans.

Injury: To dried beans, which it destroys for successive generations like the common bean weevil.

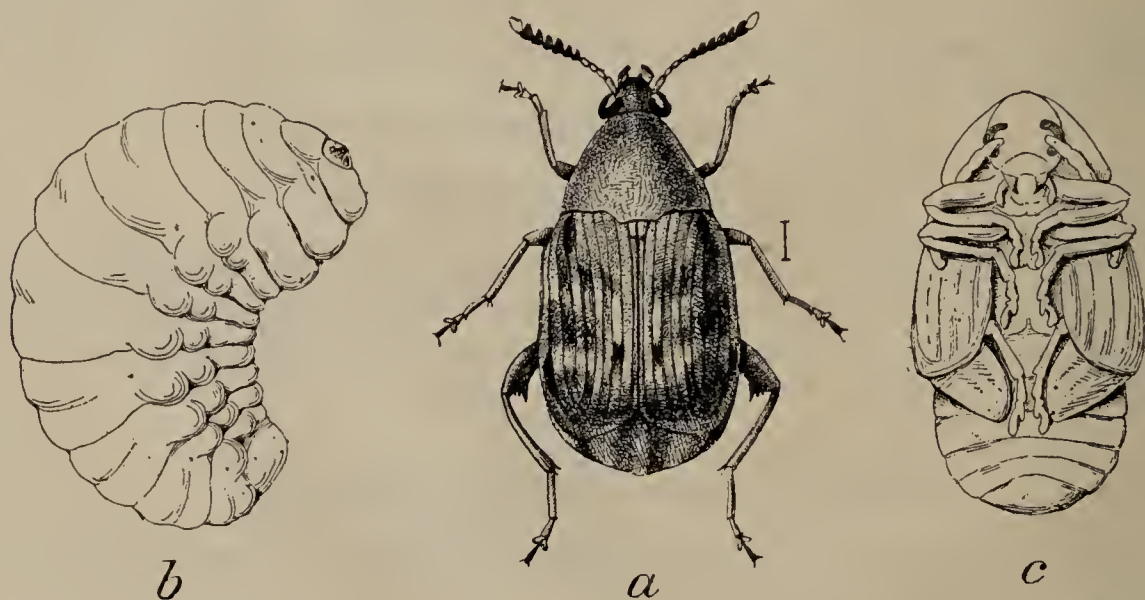


FIG. 21.—Bean weevil (*Acanthoscelides obtectus*): a, Adult; b, larva; c, pupa. (Chittenden.)

Description: A small black rounded beetle with white marks on the elytra or wing-covers.

Distribution: Mexico, Guatemala, Nicaragua, Panama, Brazil, Texas.

CHITTENDEN, F. H.: U. S., Dept. Agric., Yearbook 1898, pp. 233-260.

Agromyza phaseoli.

(Bean Fly. Agromyzidae; Diptera.)

Hosts: Lima, Tonga, French, and Madagascar beans.*Injury:* Larvae bore in stalks.*Distribution:* Australia.

FROGGATT, W. W. Agricultural Gazette, N. S. W. Feb., 1911.

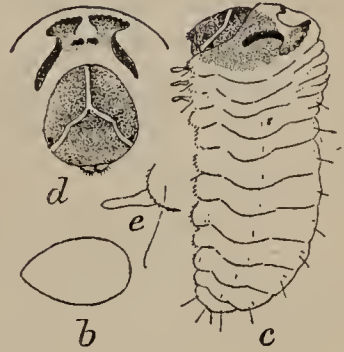
JARVIS, E. Queensland Agricultural Journal, March, 1913, pp. 192-195, Plates 30, 31.

Lycæna bætica.

(Blue or Hairstreak Butterfly. Lycaenidæ; Lepidoptera.)

Hosts: Beans, garden peas, cow-peas, Jack beans, crotalaris, and pigeon peas.*Injury:* Larvæ attack pods, devouring growing seeds.*Distribution:* Hawaii.

FULLAWAY, D. T. Annual Report, Hawaii Agri. Exp. Sta. 1911 (1912), p. 21.

FIG. 22.—Bean weevil (*Pachymerus chinensis*): a, Adult; b, egg; c-e, larva and details. (Chittenden.)**Hyalopeplus pellucidus.**

(Hawaiian leaf-bug. Capsidae; Heteroptera.)

Host: Pigeon peas.*Injury:* By sucking juices from plants.*Distribution:* Hawaii.

FULLAWAY, D. T. Annual Report, Hawaii Agri. Exp. Sta. 1911 (1912), p. 23.

Zizera labradus Godt.

(Victoria Bean Butterfly. Lycaenidæ; Lepidoptera.)

Hosts: Beans, peas.*Injury:* Feeds in the pods, a serious pest in Victoria.*Description:* Butterfly one of the group known as "Blues." Larva flattened, green, very hairy. Egg circular, pitted.*Distribution:* Australia.

FRENCH, C.: Handbook of Destructive Insects of Victoria, pt. 4, 1909, pp. 62-66, pl. 49.

Maruca testulalis Geyer.

(Bean Pod Borer. Pyralidæ; Lepidoptera.)

Hosts: Mung (*Phaseolus mungo*), moth (*Phaseolus aconitifolius*), tur (*Cajanus indicus*).FIG. 23.—Bean weevil (*Pachymerus quadrimaculatus*): a, Adult; b, larva; c, pupa. (Chittenden.)*Injury:* Breeds in the pods of legumes.*Description and biology:* Adult wing expanse 26-30 mm., fuscous brown, forewing with conspicuous black edged white spot, hind wing white, with a marginal fuscous band. Larva 12 mm. long, green; sometimes with a pink tinge, hairs on small black tubercles. Bores inside of the pods and pupates in its borings.*Distribution:* Australia and Asia.

MAXWELL-LEFROY, H. M. Mem. Dept. Agric. India, vol. 1, 1907, p. 216, fig. 66.

B. OTHER IMPORTANT BEAN INSECTS.

COLEOPTERA.

Chrysomellidæ.

Cerotoma denticornis Olivier, leaf beetle; Porto Rico (see text fig. 24).

Curculionidæ:

Sitona lineata Linnæus,* *S. flavescens* Marsh.; Europe. (See Clover.)

Hypera variabilis Herbst; Europe. (See Clover.)

DIPTERA.

Trypetidæ.

Dacus cucurbitae Coquillett; India, Ceylon, Hawaii; attacks fruit. (See Cucurbits).

Ceratitis capitata Wiedemann, attacks *Phaseolus vulgaris*. (See Fruit.)

Bactrocera cucurbitæ.

Bactrocera tryoni.

Anthomyiidæ.

* *Chortophila* (*Pegomya*) *fusciceps* Zetterstedt. (See Corn.)

Agromyzidæ.

Agromyza fabalis Jack; bean stem maggot, Rhodesia, mines stems of cowpeas, French beans, kidney and haricot beans.

LEPIDOPTERA.

Hesperiidæ.

* *Eudamus proteus* Linnæus, bean leaf roller; Porto Rico; Southern States.



FIG. 24.—Bean leaf-beetle (*Cerotoma denticornis*): Adults, two varieties. (Chittenden.)

BEECH.

(*Fagus* spp. Family Fagaceæ.)

This genus contains tall, hardy, deciduous trees favored for parks. The wood is valuable and the nuts edible. The nuts also yield an oil used for cooking. Propagated from seed. Valuable for nursery stock.

A. BEECH PESTS LIKELY TO BE IMPORTED.

Laspeyresia grossana Haworth. (Carpocapsa.)

(Beech Tortrix. Tortricidæ; Lepidoptera.)

Hosts: Hazelnut, walnut, oak, beech, chestnut.

Injury: Seldom serious. Attacks fruits of its hosts.

Description and biology: Adult, forewing bluish ash-gray; translucent spot brownish gold streaked with black, brown at base, bounded by triangular spots. Flies in June and July (Germany). Pupates in spring in the earth. Larva attacks nuts in late summer, winters in earth.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 276.

B. OTHER IMPORTANT BEECH PESTS.

HEMIPTERA.

Aphididæ.

Pterochlorus ersiccator Altum, a nonmigratory plant louse; middle Europe; very injurious to the twigs and stems of young trees.

**Phyllaphis fagi* Linnæus, nonmigratory plant louse; Europe; feeds on foliage.

Coccidæ:

Unarmored—

Cælostomidia assimilis Maskell; New Zealand; attacks *Fagus menziesii* and *F. fusca*.

Cælostomidia pilosa Maskell; New Zealand.

Cryptococcus fagi Baerensprung; Europe; *Fagus sylvatica*.

Eriococcus aceris Signoret; Europe; *Fagus sylvatica*.

Eriococcus fagicorticis Maskell; New Zealand; *Fagus fusca*.

Eriococcus pallidus Maskell; New Zealand; *Fagus fusca*.

Eriococcus raithbyi Maskell; New Zealand; *Fagus menziesii*.

Gossyparia cavellii Maskell; New Zealand; *Fagus menziesii*.

Inglisia fagi Maskell; New Zealand.

Phenacoleachia zealandica Maskell; New Zealand.

Pulvinaria betulæ Linnæus; Europe; *Fagus sylvatica*.

Rhizococcus intermedius Maskell; New Zealand; *Fagus menziesii*.

Rhizococcus pulchellus Maskell; New Zealand; *Fagus fusca*, *F. menziesii*, *F. cliffortioides*.

Rhizococcus totaræ Maskell; New Zealand; *Fagus menziesii*.

Rippersia fagi Maskell; New Zealand; *Fagus menziesii*.

Solenococcus fagi Maskell; New Zealand.

COLEOPTERA.

Anobiidæ.

Xestobium plumbeum Illiger; Europe; injures wood for technical purposes.

Xestobium rufovillosum De Geer; Europe; injures wood for technical purposes.

Ptilinus pectinicornis Linnæus; Europe; bores in wood.

Elateridæ.

Athous subfuscus Müller, a snapping beetle; Europe; larvæ destroy germinating beech.

Lymexylonidæ.

Hylecætus dermestoides Linnæus; Europe; breeds in bark and wood.

Scarabæidæ.

Amphimallon solstitialis Linnæus; Europe; develops like the June beetle at the roots of trees.

Melolontha hippocastani Fabricius, and *M. melolontha* Linnæus; Europe; also breed at the roots of seedlings and as adults feed on the foliage.

Polyphylla fullo Linnæus; Europe; breeds at the roots of trees and the adults feed on the foliage.

Buprestidæ.

Agilus angustulus Illiger, *A. biguttatus* Fabricius, *A. elongatus* Herbst, and **A. viridis* Linnæus (see Oak); wood borers; Europe; attack bast and sapwood, especially of young trees.

Cerambycidæ.

Callidium æneum DeGeer; and *C. violaceum* Linnæus; long-horned wood borers; Germany; attack wood of felled trees and lumber.

Saperda scalaris Linnæus; Europe; bores in wood. (See Poplar.)

Chrysomelidæ.

Haltica quercetorum Foudr.; a leaf beetle; Germany. (See Oak.)

Brachyrhinidæ.

Strophosoma capitata De Geer, and *S. melanogramma* Forster, weevils; Europe; adults feed on the leaves and buds of seedlings.

Polydrusus cervinus Linnæus, *P. chrysomela* Olivier, *P. griseomaculatus* Desbrochers, *P. lateralis* Gyllenhal, *P. micans* Schönherr, *P. mollis* Stroem, *P. picus* Fabricius, **P. sericeus* Schall., and **P. viridicollis* Baudi, weevils; Europe; as adults feed on buds and foliage; probably breed at the roots. The two latter species have been introduced into the United States.

Phyllobius argentatus Linnæus, *P. urticæ* De Geer and *P. viridicollis* Fabricius; weevils; Europe; adults injure buds and leaves.

Attelabidæ.

Apoderus coryli Linnæus, a leaf rolling weevil, Europe; larva breeds in the leaf rolls.

Rhynchites alni Müller and *Rhynchites betulæ* Linnæus, leaf rolling weevils; Europe; larvæ breed in the leaf rolls.

Byctiscus betulæ Linnæus, a leaf rolling weevil; Europe.

Curculionidæ.

Orchestes fagi Linnæus, a small jumping weevil; Europe; mines the leaves.

Hyllobius abietis Linnæus, a large weevil; Europe; bores in the bark of seedlings.

Cossonidæ.

Rhyncolus lignyarius Marsh., a small elongate weevil; Europe; bores in the trunks.

Rhyncolus truncorum Germar, a small weevil; Europe; bores in timber.

Scolytidæ, Ipidæ.

Scolytus intricatus Ratzeburg; Russia, Germany; makes galleries in bast.

Anisandrus dispar Fabricius; Germany; makes galleries in wood, causing great damage.

Ernoporos fagi Fabricius; Europe; makes galleries in bark of *Fagus sylvatica*.

Taphrorychus bicolor Herbst, and *T. villifrons* Dufour; Europe; make galleries in bark.

Xyleborus dryographus Ratzeburg, and *X. monographus* Fabricius; Europe; makes galleries in the wood of living trees.

Xyloterus domesticus Linnæus, and *X. signatus* Fabricius; Europe; makes galleries in sapwood of branches and in the wood of the trees.

LEPIDOPTERA.

Cossidæ.

**Zeuzera pyrina* Linnæus; Europe, Africa, North America; breeds in the wood. (See Horse-chestnut.)

Cossus cossus Linnæus; the goat moth; Europe; breeds in the wood. (See Willow.)

Drepanidæ.

Drepana cultraria Fabricius; Europe; defoliator.

Notodontidæ.

Phalera bucephala Linnæus; Europe. (See Forests.)

Geometridæ.

Cheimatobia boreata Hübner; Germany; feeds on young growth.

Hibernia aurantiaria Esp., *H. defoliaria* Linnæus and *H. marginaria* Borkh.; Europe; feed on foliage.

Larentia dilutata Borkh.; Europe; feeds on foliage.

Lasiocampidæ.

Malacosoma neustria Linnæus; Europe; feeds on buds and leaves (see Forests).

Lymantriidæ.

Dasychira pudibunda Linnæus, **Euproctis chrysorrhæa* Linnæus, **Lymantria monacha* Linnæus,

**Porthetria dispar* Linnæus, *Porthesia similis* Fuessly (see Forests).

Noctuidæ.

Acronycta aceris Linnæus; Europe; defoliator.

Scopelosoma satellitia Linnæus; Germany; injurious to young growth.

Pluteliidæ.

Cerostoma parenthesella Linnæus; Europe; attacks leaves of seedlings.

Tortricidæ.

**Peronea ferrugana* Treitschke; Europe; North America; attacks leaves.

Tortrix podana Sc.; Europe; attacks leaves of seedlings.

HYMENOPTERA.

Cimbicidæ.

Cimbex fagi Zadd.; sawfly; Europe; feeds on foliage.

Xiphydridæ.

Xiphydrya camelus Linnæus; wood wasp; Europe; bores in wood.

DIPTERA.

Itonididæ.

Hormomyia annulipes Htg. and *H. fagi* Htg., gall midges, Europe; from galls on leaves.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887.

FERNALD, MARIA E. Catalogue of Coccidæ of the World, Mass. Agr. Coll., Bul. 88, 1903.

BEET; MANGELWURZEL OR MANGOLD; SUGAR BEET; CHARD.*(Beta vulgaris* Linnæus. Family Chenopodiaceæ.)

The beet and its varieties are grown from seed. The varieties have been developed either for their roots or their foliage, which are edible. A race of showy foliage beets has been developed which make excellent flower-garden borders. The species occurs in America, Europe, and as far east as Persia, and the Caspian Sea. Insects are most likely to be introduced in shipments of beet roots.

A. BETTER KNOWN BEET INSECTS LIKELY TO BE IMPORTED.*Atomaria linearis* Stephens.

(Pigmy Mangold Beetle. Cryptophagidæ; Coleoptera.)

Hosts: Mangolds, beets, sugar beets.*Injury:* Very destructive by destroying sprouts at time of germination and later attacking both roots and leaves.*Description:* Beetle 1-1.5 mm. long, dark brown, with fine pubescence. The life history has not been worked out.*Distribution:* Europe (England).

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 475, fig. 290.

THEOBALD, FRED. V. First Rept. Econ. Zool., Brit. Mus. Nat. Hist., 1903, pp. 8, 9, figs.

JABLONOWSKI, JOZSEF. Die Tierischen Feinde der Zuckerrübe (translation by Julius Reitzer), 1909, pp. 136-142, fig. 31.

* *Cassida nebulosa* Linnæus.

(Beet Tortoise Beetle. Cassididæ; Coleoptera.)

Host: Beets, sugar beet, orache, lambsquarter, *Atriplex*, etc.*Injury:* Both larva and adult feed on the foliage.*Description:* Beetle dorsally flattened in the shape of a tortoise shell, about 6 mm. long, yellowish gray or pale green.*Distribution:* Europe, Asia (Persia to Siberia), and recorded from California in 1894.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 533.

CHITTENDEN, F. H. U. S. Dept. Agr., Div. Entom., 1903, bul. 43, p. 14, fig. 6.

JABLONOWSKI, JOZSEF. Die Tierschen Feinde der Zuckerrübe translation by Julius Reitzer), 1909, pp. 261-263, fig. 55.

Cleonus punctiventris Germar.

(Beet Root Weevil. Curculionidæ; Coleoptera.)

Hosts: Beet, *Polygonum*, thistle, goosefoot, tobacco, *Salsola*.*Injury:* Adults feed on young plants; larvæ feed at the roots of beets. Very destructive in east Europe.*Description and biology:* An elongate subcylindrical weevil with stout beak. The larvæ feed at roots as low as 60 cm. below the surface. Pupate in the larval feeding places.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 546, 547.

Gelechia ocellatella Boyd; *Gelechia atriplicella* F. R.; *Gelechia instabilella* Douglas. (Lita.)

(Beet leaf miners. Gelechiidæ; Lepidoptera.)

Hosts: Beets, sugar beets, mangolds.*Injury:* Mine the leaves, and sometimes *G. ocellatella* bores in the crown and a short distance into the roots.

Description and biology: *G. ocellatella* is a small yellowish gray moth with dark ribs and an apical spot on the front wings; hind wings as large as front and whitish gray; pupates in leaf rolls, in the roots or outside. Larva 10 to 12 mm. long, pale greenish with a transverse row of reddish spots on each segment and two or three longitudinal rose colored stripes. Feeds on leaves and for a short distance into the roots.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 263, f. 192.

JABLONOWSKI, JOZSEF. Die Tierischen Feinde der Zuckerrübe (translation by Julius Reitzer), 1909, pp. 136-142.

* *Hymenia fascialis* Cramer.

(Hawaiian Beet Webworm. Pyralidæ; Lepidoptera.)

Hosts: Sugar beet, Swiss chard, mangel-wurzel, *Amarantus*, *Euxolus*, purslane (*Portulaca oleracea*), cucumber, Chenopodiaceae.

Injury: Capable of doing considerable damage to truck by feeding on foliage. Has been widely distributed. (See text figs. 25, 26.)

Distribution: Japan, Hawaii, Tropical America, Porto Rico, Europe, South Africa, Australia, Madagascar, Reunion, Mauritius, Florida, Alabama, California, District of Columbia.

MARSH, H. O. U. S. Dept. Agr., Bur. Entom., Bul. 109, pt. 1, 1911, pp. 1-15, pl. 1, figs. 1, 2.

* *Chortophila* (*Pegomya*) *hyoscyami* Panzer. (*Phorbia vicina* Lintn.)

(Beet fly or spinach leafminer. Anthomyidæ; Diptera.)

Hosts: Spinach, beets, sugar beets, mangolds, orache, henbane, goose-foot.

Injury: Mines leaves. The mines are blisterlike.

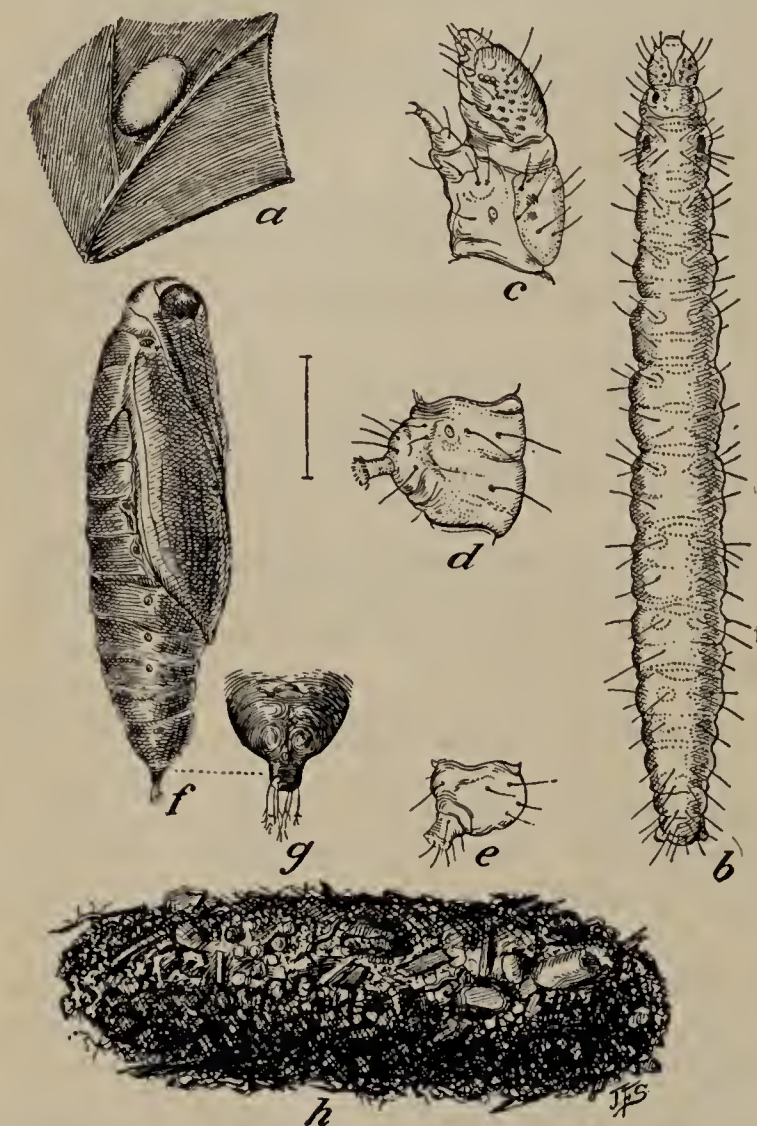


FIG. 25.—Hawaiian beet webworm (*Hymenia fascialis*): a, Egg on leaf; b, larva, dorsal view; c, larva, head and first thoracic segment; d, abdominal segment, lateral view; e, anal segment; f, pupa, lateral view; g, cremaster; h, cocoon. All enlarged. (Marsh.)

Description and biology. Fly thorax lead gray, with five faint dorsal stripes, abdomen yellow gray with a faint brownish stripe; entire body with black bristles; head silver white, with reddish shimmer; front and scutellum with orange, silver gray streaks; eyes red; palpi yellow with dark apex; femora yellowish, tibiae brown; length, 6 mm. The species varies in color and has received a number of names.

Distribution: Europe. Introduced into the United States and quite injurious to spinach.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 428, 429, fig. 261.

CHITTENDEN, F. H. U. S. Dept. Agr. Div. Ent., bul. 43, 1903, pp. 50-52, fig. 50 (*P. vicina* Lintner).

ORMEROD, Miss E. Manual Injurious Insects, 1890, pt. 1, pp. 144-147, fig. (*P. betae* Curt.).

JABLONOWSKI, JOZSEF. Die Tierischen Feinde der Zuckerrübe (translation by Julius Reitzer), 1909, pp. 303-315, figs. 61-63.

B. OTHER IMPORTANT BEET INSECTS.

ACARINA.

Tetranychidæ.

Tetranychus telarius Linnæus, the red spider; Europe; very injurious to sugar-beet foliage.

HEMIPTERA.

Aphididæ.

Aphis rumicis Linnæus; Europe; sugar-beet foliage.

ORTHOPTERA.

Gryllotalpidæ.

**Gryllotalpa gryllotalpa* Linnæus (*vulgaris* Latreille); Europe, introduced into New Jersey; injures roots.

Gryllidæ.

Gryllus melas Charp.; Europe; seriously injures the roots.

COLEOPTERA.

Silphidæ.

**Blitophaga opaca* Linnæus; Europe, North America; feeds as larva on foliage of beets, an unusual habit for this family. It is harmless in America at present.

Blitophaga undata Miller; *Silpha obscura* Linnæus; and *Phosphuga atrata* Linnæus; Europe; larvae feed on foliage of beets.

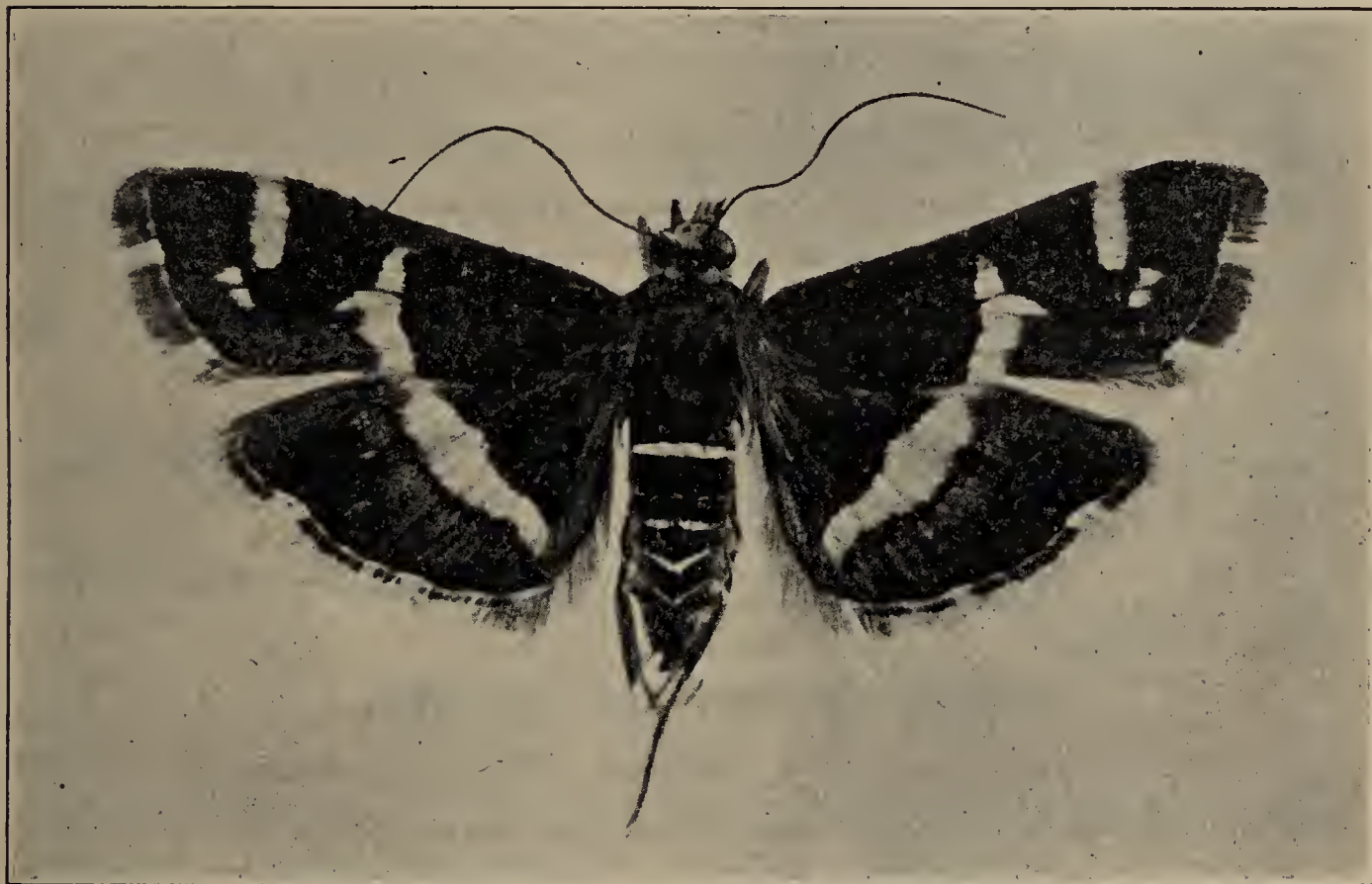


FIG. 26.—The Hawaiian beet webworm (*Hymenia fascialis*): Female moth. Enlarged. (Marsh.)

Tenebrionidæ.

Pedinus femoralis Linnæus, and *Gonocephalum (Opatrum) sabulosum* Linnæus; Hungary; larvæ injurious to roots of sugar beet; adults injure the foliage.

Coccinellidæ.

Subcoccinella 24-punctata Linnæus; Europe; larvae and adults injure vegetation.

Elateridæ.

Lacon murinus Linnæus and *Corymbites aeneus* Linnæus, wireworms; Europe; attack the roots of seedlings.

Athous niger Linnæus. (See Tobacco.)

Agriotes lineatus Linnæus. (See Tobacco.)

Meloidæ.

Epicauta rufidorsum Goeze, blister beetle; Europe; defoliates and sometimes destroys entire plants.

Scarabæidæ.

Melolontha vulgaris Linnæus, June beetle, Europe; larvæ feed at roots.

Rhizotrogus æquinotialis Herbst; Europe; the larvæ feed at the crown and roots killing many plants.

Chrysomelidæ.

Cassida vittata Vill; Europe; larva and adult feed on foliage.

Chalcoides chloris Foudr., *Chætocnema tibialis* Illiger, *Psylliodes attenuata* Koch, *P. chrysocephala* Linnæus, *Phyllotreta vittula* Redtenbacher, *P. nemorum* Linnæus, *P. nigripes* Fabricius, *P. atra* Fabricius, *P. cruciferæ* Goeze, flea beetles; Europe; injure the foliage.

Brachyrhinidæ (Otiorhynchidæ).

Brachyrhinus raucus Fabricius (*Otiorhynchus*), *B. ligustici* Linnæus, *B. orbicularis* Herbst; Europe; adults injure the foliage and young plants.

Psallidium maxillosum Fabricius; Europe; adult injures plants.

Curculionidæ.

Liparus coronatus Goeze; Europe; breeds in the roots.

Bothynoderes punctiventris Germar; and *B. farinosus* Fahraeus; Europe; adults injure foliage, larvæ breed in roots.

Cleonus piger Scopoli, *C. fasciatus* Müller, *C. mendicus* Gyllenhal, *C. tigrinus* Panzer, *C. ucrainiensis* Gawr., *C. pedestris* Podg., *C. cinereus* Schr.; Europe; breed in roots of beets or adults attack seedlings and foliage.

Lixus ascanii Linnæus; Europe; breeds in the stems.

Cionus scrophulariæ Linnæus; Europe; adults feed on foliage of beets and mangolds.

LEPIDOPTERA.

Pyralidæ.

**Phlyctænia ferrugalis* Hübner; Europe, Asia, North America (see Cabbage).

Noctuidæ.

Agrotis segetum Schiffermiller, *A. plecta* Linnæus, *A. exclamationis* Linnæus, cutworms; Europe; injure young plants and roots.

Mamestra brassicæ Linnæus, *M. dissimilis* Kn., *M. oleracea* Linnæus; Europe; feed on foliage.

Calocampa exoleta Linnæus; Europe; attacks beets.

**Plusia gamma* Linnæus; Europe; Asia, North America; in Europe injurious to beets.

HYMENOPTERA.

Tenthredinidæ.

Athalia spinarum Fabricius, a saw fly; Europe; South Africa; attacks foliage of beets (see Turnip).

DIPTERA.

Tipulidæ.

Pachyrhina maculata Meigen, a crane fly; Europe; larva attacks the roots of beets.

Tipula oleracea Linnæus and *Tipula paludosa* Meigen; Europe; also occasionally attack beet roots.

LITERATURE.

JABLONOWSKI, J. Die Tierischen Feinde der Zuckerrübe (translation by J. Reitzer), Budapest, 1909.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d edit., 1913, vol. 3.

BARGAGLI, P. Rassegna Biologica di Rincofori Europei, 1883-1887.

BERSEEM; EGYPTIAN CLOVER.

(*Trifolium alexandrinum* Linnæus. Family Leguminosæ.)

This forage plant has been introduced in a small measure into the United States from Egypt. It has a number of important enemies in Egypt which attack other crops also grown in this country. (See Clover.)

BETEL NUT.

(*Areca catechu*, etc. Family, Palmaceæ.)

A tropical palm yielding the betel nut of commerce.

IMPORTANT ARECA INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Aspidiotus (Chrysomphalus) alienus Newstead; *Areca lutescens*.

**Pinnaspis buxi* Bouché; Trinidad, Brazil, New York, District of Columbia; *Areca catechu*, *A. lutescens*. Female scale 1—1.5 mm. long, narrow, reddish-brown or orange-brown with extremity lighter. Second exuvium comparatively large, occupying a trifle over one-third the puparium, which bears a strong resemblance to that of *Lepidosaphes*. Sides nearly parallel.

Unarmored—

Coccus acutissimus Green; Ceylon; *Areca catechu*. (See Mango.)

Coccus minimus Newstead; England; Mexico; *Areca catechu*.

Leucodiaspis cockerelli de Charmoy; Brazil; *Areca lutescens*.

BIRCH.

(Betula spp. Family Betulaceæ.)

Ornamental deciduous trees or shrubs grown chiefly for their bright green handsome foliage. There are many species occurring in North America, Europe, north and central Asia. Propagated from seed and readily transplanted. The bark and wood are of value in the arts and crafts, and some species yield a sap used as a beverage. The bark of *B. papyrifera* is used in making canoes and for tanning leather.

A. BETTER KNOWN BIRCH PESTS LIKELY TO BE IMPORTED.**Eriophyes rudis** Can.

(Birch Blister Mite. Eriophyidæ; Acarina.)

*Hosts: Betula alba, B. pubescens, B. odorata.**Injury:* Causes gall-like swellings of the buds. Ultimately kills a tree.*Description and biology:* A four-legged blister mite which forms gall-like swellings of the buds. Very easy to introduce on nursery stock.*Distribution:* Europe, England (especially severe around London).

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d edit. vol. 3, 1913, p. 117, 118. fig. 93.

Magdalis carbonaria Linnæus.

(Birch Twig Weevil. Curculionidæ; Coleoptera.)

Hosts: Corylus avellana L., *Prunus domestica* L., *Betula alba* L., *Juglans regia* L., *Pinus*.*Injury:* Breeds in young twigs.*Description and biology:* Weevil similar to the common *Magdalis* species of this country. The eggs are laid in small dead or injured twigs. Larva feeds in medullary canal of twigs. Pupates in tunnel. Adults feed on foliage.*Distribution:* Europe.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887, p. 194.

B. OTHER IMPORTANT BIRCH PESTS.**HEMIPTERA.****Aphididæ.***Glyphina betulæ* Kaltenbach, a plant louse; Germany; attacks leaves and twigs.**Coccidæ:**

Armored—

Chionaspis salicis Linnæus; Europe.

Unarmored—

Lecanium ciliatum Douglas; Europe.*Lecanium coryli* Linnæus; Europe.*Lecanium pulchrum* Marchal; Europe; *Betula verrucosa*.*Pulvinaria betulæ* Linnæus; Europe; *Betula alba*.**ORTHOPTERA.****Gryllotalpidæ.****Gryllotalpa gryllotalpa* Linnæus; Europe, New Jersey; injures roots, young shoots, and germinating seed. (See text, fig. 27.)FIG. 27.—Mole cricket, *Gryllotalpa*. (Kurdjumov.)

COLEOPTERA.

Buprestidæ.

**Agrilus viridis* Linnæus; a wood borer; Europe; bores in bast and sapwood of seedlings and young stems and branches of older trees.

Lymexylonidæ.

Hylecætus dermestoides Linnæus; a wood borer; Germany, Sweden.

Passalidæ.

Basilianus cantori Perch.; a large black beetle; India; breeds in rotting wood.

Scarabæidæ.

Anomala ænea De Geer, Europe, adults attack foliage.

Melolontha hippocastani Fabricius, and *M. melolontha* Linnæus, June beetles; breed at the roots of seedlings, and adults feed on foliage.

Polyphylla fulva Linnæus; Europe; also attacks roots and foliage in the same manner.

Chrysomelidæ.

Agelastica alni Linnæus; a leaf beetle; Europe; larvæ and adults feed on foliage.

Lochmæa capræ Linnæus; Europe; larvæ and adults feed on foliage.

Melasoma ænea Linnæus; Europe; larvæ and adults feed on foliage.

Haltica quercetorum Foudr.; Europe; defoliates. (See Oak.)

Cerambycidæ.

Rhagium mordax De Geer; Sweden; bores in stems and branches.

Attelabidæ.

Rhynchites betulæ Linnæus, *Apoderus coryli* Linnæus, and *Byctiscus betulæ* Linnæus; leaf-rolling weevils; Europe; the larvæ breed in the rolls.



FIG. 28.—*Scolytus ratzeburgi*: Male much enlarged. (Nüsslin.)

Brachyrhinidæ (Otiiorhynchidæ).

Strophosoma capitata De Geer, and *S. melanogramma* Forster; weevils; Europe; adults feed on foliage, and larvæ at the roots.

Brachyderes incanus Linnæus, a weevil; Europe; adults feed on foliage.

Metallites iris Olivier; Europe; breeds at roots, adults attack buds and leaves.

Polydrusus cervinus Linnæus, *P. intermedius* Zetterstedt, *P. planifrons* Gyllenhal, and *P. undatus* Fabricius; Europe; feed as adults on foliage of *Betula alba*, and probably some of them breed on the plant. This is a dangerous genus.

Phyllobius argentatus Linnæus, *P. betulæ* Fabricius, *P. maculicornis* Germar, *P. pyri* Linnæus, and *P. sinuatus* Fabricius; Europe; feed as adults on foliage and probably some of them breed on the plant.

Curculionidæ.

Anoplus plantaris Schönherr; Europe; adults feed on buds and young leaves.

Hylobius abietis Linnæus; Europe; bores in the bark.

**Cryptorhynchus lapathi* Linnæus; Europe; breeds in young shoots, branches, bark, and wood. An important pest introduced into the United States.

Scolytidæ, Ipidae.

Scolytus ratzeburgi Janson, and *S. rugulosus* Ratzeburg; Europe; make galleries in bark. (See text fig. 28.)

Anisandrus dispar Fabricius; Germany; makes galleries in wood.

Xyloterus domesticus Linnæus, and *X. signatus* Fabricius; Germany; galleries in sapwood.

LEPIDOPTERA.

Cossidæ.

Cossus cossus Linnæus; goat moth; Europe; bores in wood. (See Willow.)

**Zeuzera pyrina* Linnæus; Europe, Africa, North America; bores in wood. (See Horse chestnut.)

Geometridæ.

Anisopteryx æscularia Schiffermiller; a looper; Europe; feeds on foliage.

Cheimatobia boreata Hübner; Europe; feeds on buds, leaves, and new growth.

Hibernia aurantiaria Esp., *H. defoliaria* Linnæus, and *H. marginaria* Borekh.; Germany; feed on buds and leaves.

Larentia dilutata Borekh.; Europe; feeds on foliage of *Betula odorata*.

Larentia nebulata Tnbg.; Sweden; feeds on foliage.

Lasiocampidæ.

Eriogaster lanestris Linnæus; Germany; feeds on foliage.

Malacosoma neustria Linnæus; Europe; defoliator. (See Forests.)

Lymantriidæ.

Dasychira pudibunda Linnæus, **Lymantria monacha* Linnæus, **Porthetria dispar* Linnæus, *Porthesia similis* Fuessly, forest defoliators; Europe. (See Forests.)

Sesiidæ.

Sesia spheciformis Grng.; Europe; bores in trunk.

Sesia scolixformis Borekh.; Sweden; bores in trunk.

Tortricidæ.

**Peronea ferrugana* Treitschke; Europe, North America; attacks foliage.

Notodontidæ.

Phalera bucephala Linnæus; Europe. (See Forests.)

HYMENOPTERA.

Cimbicidæ.

Cimbex variabilis Klg., a saw fly; Europe; feeds on foliage.

Trichiosoma lucorum Linnæus; Europe; defoliates.

Tenthredinidæ.

Nematus (Croesus) septentrionalis Linnæus; Europe; defoliates.

Priophorus padi Linnæus; Europe (see Plum).

Xiphydridæ.

Xiphydria prolongata Linnæus, wood wasp; Europe; bores in the wood.

BIBLIOGRAPHY.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3rd edit., 1913, vol. 3.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2nd edit., 1913.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887.

TRÄGÅRDH, I. Sveriges Skogsinsekter, 1914.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

BLACKBERRY; RASPBERRY; LOGANBERRY.

(*Rubus* spp. Family Rosaceæ.)

A large genus of shrubs bearing many different kinds of delicious small fruits natives of America, Europe, and Asia.

IMPORTANT BLACKBERRY INSECTS.

COLEOPTERA.

Byturidæ.

Byturus tomentosus Fabricius; Europe; larva feeds in fruit of raspberries and blackberries.

Brachyrhinidæ.

Brachyrhinus tenebricosus Herbst; Europe; larvæ attack roots, adults attack foliage.

Curculionidæ.

Rhinaria perdix Pascoe; Australia.

Hypera variabilis Herbst; Europe; raspberry. (See Clover.)

Anthonomus rubi Herbst; Europe; larva at roots, adult attacks foliage.

LEPIDOPTERA.

Tortricidæ.

Notocelia roborana Treitschke; Europe. (See Currant.)

Sesiidæ.

Bembecia hylæiformis Lasp.; Europe; bores canes.

Lasiocampidæ.

Macrothylacia rubi Linnæus; Europe; defoliator.

HYMENOPTERA.

Tenthredinidæ.

Entodecta pumila Klug, a sawfly; Europe; mines in leaves.

Cephididæ.

Janus fumipennis Ever.; Europe; mines in stems.

BOX.(*Buxus* spp. Family Euphorbiaceæ.)

Evergreen shrubs or small trees commonly used for hedges, occurring natively in Central and Eastern Asia, North Africa, Europe, and Central America, and much used in this country.

IMPORTANT INSECT ENEMIES OF BOX.**HEMIPTERA.****Coccidæ:**

Unarmored—

Eriococcus buxi Fonscolombe; Europe.**DIPTERA.****Itonididæ (Cecidomyiidæ).*** *Monarthropalpus buxi* Laboulbene; Europe, eastern United States; leaf miner.**BROOM CORN.**

(See Sorghum.)

BRUSSELS SPROUTS.

(See Cabbage.)

BUCKTHORN.(*Rhamnus* spp. Family Rhamnaceæ.)

Ornamental deciduous or evergreen shrubs or trees propagated from seed or cuttings. The genus occurs chiefly in the northern temperate regions, but some species are found in Brazil and South Africa. The wood of *R. frangula* is made into charcoal valued for the manufacture of gunpowder.

IMPORTANT INSECTS ATTACKING BUCKTHORN.**HEMIPTERA.****Coccidæ.***Lecanium ciliatum* Douglas; Germany, Tyrol; attacks *Rhamnus alaternus*, and *R. frangula*.*Chionaspis salicis* Linnæus; Austria; attacks *R. frangula*.A number of scales already in the United States also attack *Rhamnus*.**LEPIDOPTERA.****Cossidæ.*** *Zeuzera pyrina* Linnæus; Europe, Africa, N. America, bores in wood. (See Horse-chestnut.)**Lymantriidæ.***Dasychira pudibunda* Linnæus, a defoliator; Europe. (See Forests.)* *Lymantria monacha* Linnæus, the nun moth; Europe; defoliator. (See Forests.)**Hyponomeutidæ.***Hyponomeuta padi* Zeller, a web worm; Europe; attacks *R. frangula*.*Hyponomeuta evonymella*, a web worm; Europe.**LITERATURE.**

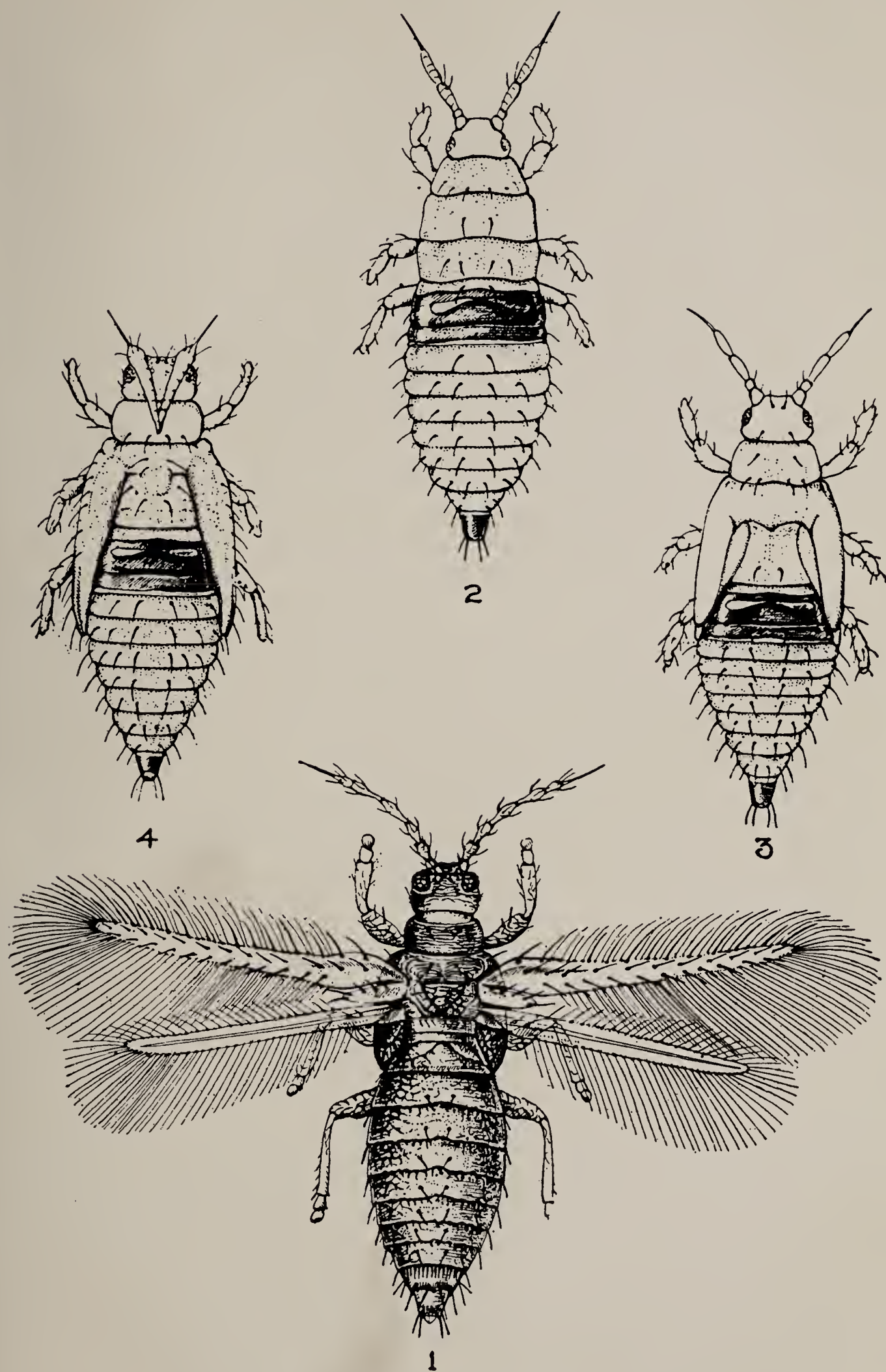
SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

HESS, R. Der Forstschutz, 1900, vol. 2.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

CABBAGE; KALE; COLLARD; BRUSSELS SPROUTS; CAULIFLOWER; KOHLRABI.(*Brassica oleracea* Linnæus, varieties. Family Cruciferæ.)

The many varieties of this species especially in Europe, have very important pests, which it is not desirable to have imported into this country. Since the flower head is used in some varieties, the foliage in others, and the roots in others, there is danger of importing almost any pest of the species.



THE RED-BANDED THRIPS.

The red-banded thrips (*Heliothrips rubrocinctus*): FIG. 1.—Adult. FIGS. 2-4.—Nymphal stages (Russell.)

A. BETTER KNOWN CABBAGE PESTS LIKELY TO BE IMPORTED.***Contarinia torquens* Meijere.**

(Cabbage Midge. Itonididæ [Cecidomyidæ]; Diptera.)

Hosts: Cabbage.*Injury:* Attacks young cabbage plants, especially, breeding in the leaf axil and hindering growth. Has several generations. Pupates in soil.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 447.

***Dasyneura brassicæ* Winner.**

(Cabbage Gall Midge. Itonididæ [Cecidomyidæ]; Diptera.)

Hosts: Cabbage, rape.*Injury:* Breeds in fruit.*Description and biology:* Fly blackish brown, thorax covered with pubescence giving a silvery sheen, abdomen flesh red, with black bands; length 1.2–1.5 mm. long, milk white. Forms a gall in the fruit, feeds on the seed.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 454.

***Phaonia trimaculata* Bouché.**

(Cabbage Maggot. Anthomyiidae; Diptera.)

Hosts: Cabbage.*Injury:* Breeds in the roots.*Description and biology:* Fly light gray, four black interrupted streaks and three brown spots on thorax; eyes hairy; length 8 mm. Maggot 11 mm. long.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 432.

B. IMPORTANT CABBAGE PESTS.**ORTHOPTERA.****Gryllotalpidæ.****Scapteriscus didactylus* Latreille; Porto Rico, Georgia; quite injurious, cuts below surface of soil.**COLEOPTERA.****Elateridæ.***Agriotes lineatus* Linnæus. (See Tobacco.)**Chrysomelidæ.***Psylliodes chrysocephala* Linnæus and *P. napi* Fabricius. (See Rape.)**Brachyrhinidæ.****Barynotus squamosus* Germar; Europe, Canada; adults strip plants to ground.**Curculionidæ.***Baris glabra* Herbst, *B. chlorizans* Germar, *B. opiparis* Duval; Europe; breed in root and stem.*Baris cærulescens* Scopoli; Europe; breeds in stem.*Baris lepidii* Germar, and *B. viridisericæ* Goeze; Europe; breeds in root and crown.*Ceutorhynchus cyanipennis* Germar, and *C. sulcicollis* Paykull; Europe; breeds in crown.*Ceutorhynchus quadridens* Panzer; Europe; breeds in roots.**LEPIDOPTERA.****Pieridæ.***Pieris monuste* Linnæus, Porto Rico, southern United States; cabbage worm.**Pyralidæ.***Evergestis extimalis* Sc. (See Rape.)**Plutellidæ.***Plutella maculipennis* Curtis; cosmopolitan; destructive to leaves.

Noctuidæ.

Mamestra oleracea Linnæus and *M. brassicæ* Linnæus; Europe; very destructive to cabbage. (See text fig. 29.)

DIPTERA.

Anthomyiidae.

* *Chortophila fusciceps* Zetterstedt. (See Corn.) *Anthomyia radicum* Meigen; Europe. (See Radish.)

CACAO; CHOCOLATE.

(*Theobroma* spp. Family Sterculiaceæ.)

Cacao is a very important article of commerce entering the United States. It is not grown in the United States proper, but is to a small extent produced in Porto Rico, Hawaii, and the Philippines.

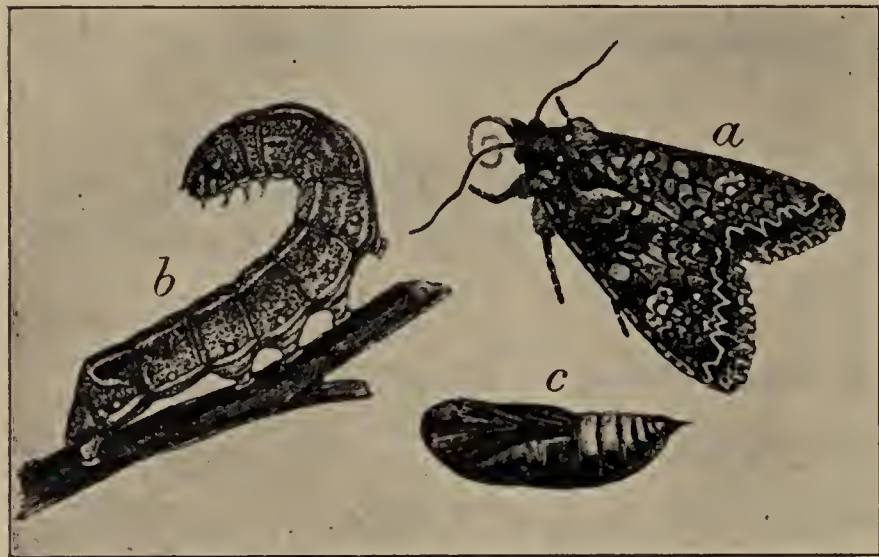


FIG. 29.—The cabbage moth (*Mamestra brassicæ*): a, Moth; b, larva; c, pupa. About natural size. (Curtis.)

A. AN IMPORTANT CACAO PEST LIKELY TO BE IMPORTED.

Zaratha cramerella Sn.

(Cacao moth. Gelechiidæ; Lepidoptera.)

Hosts: Cacao, *Nephelium lappaceum*.

Injury: Very destructive to the fruit.

Description and biology:

Moth small. Larva 10–12 mm.

long, whitish, with greenish shimmer. Pupa in oval flattened woolly cocoon on outside of fruit, leaves, and twigs.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 266.

B. OTHER IMPORTANT CACAO PESTS.

THYSANOPTERA.

* *Heliothrips rubrocinctus* Giard; West Indies, Ceylon, Uganda, Florida (see pl. X).

HEMIPTERA.

Coccidæ.

Philephedra theobromæ Green; Trinidad, *Theobroma cacao*.

Miridæ.

Helopeltis theivora and *H. antonii*; Ceylon and Java: *Sahlbergella singularis*; Kamerun.

COLEOPTERA.

Scarabæidæ.

Adoretus umbrosus Fabricius, and var. *tenuimaculatus* Waterhouse; Hawaii, Japan, Philippine Islands, Java. (See Rose.)

Buprestidæ.

Chrysochroa bicolor Fabricius, and *C. fulminans* Fabricius; Java; borers.

Cerambycidæ.

Epepeotes luscus Fabricius; Java; caoutchouc, cacao, mango.

Monohammus fistulator Germar; Java, Sumatra, Borneo; coffee, cacao (bores in bark, wood, and fruit).

Monohammus ruspator Fabricius; Kamerun; cacao.

Tragocephala senatoria Th.; Kamerun; cacao

Moecha adusta Har.; West Africa, East Africa; cacao, *Kickxia*.

Praonetha melanura Pascoe; Java; cacao, coffee.

Ecthaea quadricornis Olivier; Trinidad; cacao.

Steirastoma depressum Linnaeus; West Indies, South America; cacao, silk cotton tree (*Ceiba*), okra, etc.

Glenea novemguttata Castelnau, Java; cacao

Chrysomelidæ.

Crepidodera costatipennis Jacoby; Kamerun; defoliator.

LEPIDOPTERA.

Pyalidæ.

Dichocrocis punctiferalis Guénée; Orient. (See Corn.)

Notodontidæ.

Stauropus alternus Walker; India, Ceylon, Java; defoliator.

Cossidæ.

Zeuzera coffeæ Nietner; Asia, Africa. (See Coffee)

DIPTERA.

Trypetidæ.

Ceratitis punctata Wiedemann; Africa; fruit fly. (See Fruit)

Ceratitis anonæ Graham; Africa. (See Fruit.)

LITERATURE.

GUPPY, P. L. West Indian Bulletin, 1912, vol. 12, pp. 310-320.

AGRICULTURAL NEWS, Barbados, 1915, vol. 14, pp. 58, 59.

CANTELOUPE.

See Cucurbits.

CARROT.

(*Daucus carota* Linnæus. Family Umbelliferæ.)

The carrot is grown throughout the world. As it is a root crop there is always danger of introducing root pests.

IMPORTANT CARROT INSECTS.

COLEOPTERA.

Elateridæ.

Agriotes lineatus Linnæus. (See Tobacco.)

Brachyrhinidæ.

Cnecorhinus plagiatus Schall.; England.

Curculionidæ.

Liparus coronatus Goeze; Europe; breeds at roots

Hypera pastinacæ Rossi var. *tigrina* Boheman, *H. fasciculata* Herbst, and *H. rogenhoferi* Fairmaire; Europe; breed on the leaves like the clover weevil, *Hypera punctata*.

LEPIDOPTERA

Æcophoridæ.

Depressaria nervosa Hw.; Europe; very injurious to flower heads.

DIPTERA.

Agromyzidæ.

Phytomyza affinis Fallen. (See Tobacco.)

CASSAVA; TAPIOCA; CEARA RUBBER.

(*Manihot utilissima* Pohl., etc. Family Euphorbiaceæ.)

Cassava (*M. utilissima*) is a tropical plant, grown to a limited extent in the southern United States. As it is propagated from cuttings, there is always danger of introducing serious pests when cuttings are imported. A recent shipment of cuttings from Brazil for propagation in this country was badly infested by a stalk-boring weevil *Leiomerus granicollis* Pierce (see Proc. U. S. Nat. Mus., vol. 51, No. 2159, pp. 469-471).

Ceara rubber (*M. glaziovii*) is also an important plant.

CATALPA.

(*Catalpa* spp. Family Bignoniaceæ.)

Deciduous ornamental trees of North America, and East Asia; much cultivated in this country. The wood is valued for railway ties and fence posts.

IMPORTANT CATALPA INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

**Diaspis pentagona* Targioni-Tozzetti; Europe, Asia, Australia, Pacific Islands, Africa, South America eastern United States; attacks fruits and many other plants.

LITERATURE.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

CAULIFLOWER.

(See Cabbage.)

CEDAR.

(Cedrus spp. Family Juniperaceæ.)

Large evergreen trees of North America, North Africa, Asia Minor, and the Himalayas, highly valued for their durable and fragrant wood.

INSECTS INJURIOUS TO CEDAR (CEDRUS).

COLEOPTERA.

Buprestidæ.

Sphenoptera aterrima Kerremans; India; bores in bast and sapwood of deodar (*Cedrus deodara*).

Sphenoptera lafertei Thomson; India; deodar.

Tenebrionidæ.

Camarimena rugosistriatus Blair; India; deodar

Cerambycidæ.

Teledapus dorcadioides Pascoe; India; bores in trunk of deodar.

Strongylurus thoracicus Pascoe; Australia; white cedar.

Tetropium oreinum Gahan; India; deodar.

Trinophylum cribratum Bates; India; deodar.

Brachyrhinidæ.

Brachyrhynchus subsignatus Faust; India; defoliates deodar.

Cossonidæ.

Rhyncholus himalayensis Stebbing; India; bores in wood of deodar

Scolytidæ.

Polygraphus major Stebbing; India; bores in deodar.

Polygraphus aterrimus Strohmeier; India; deodar.

Cryphalus deodara Stebbing; India; deodar stems.

Cryphalus himalayensis Stebbing; India; deodar stems.

Ips stebbingi Strohmeier; India; deodar stems.

Pityogenes coniferæ Stebbing; India; deodar.

Scolytus major Stebbing, *S. minor* Stebbing and *S. deodara* Stebbing; India; deodar.

Platypodidæ.

Crossotarsus coniferæ Stebbing; India; deodar.

LEPIDOPTERA.

Pyralidæ.

Euzophera cedrella; India; infests cones of deodar.

Phycita abietella; India; infests cones of deodar.

CELERY.

(Apium graveolens. Family Umbelliferæ.)

A garden vegetable much cultivated for its edible stems.

A. A CELERY PEST LIKELY TO BE IMPORTED.

Acidalia heraclei Linnæus.

(Celery Fly. Trypetidæ; Diptera.)

Hosts: Celery, parsnip, *Heracleum*, *Angelica*, *Ligusticum*, *Arctium*, *Artemisia*, *Rumex*.

Injury: Mines leaves and stems, causing considerable injury.

Description and biology: Fly brownish yellow, scutellum dark, hind part of thorax and abdomen shining black; head and antennæ reddish yellow; length 5–6.5 mm. Maggot whitish. Pupates either in the leaf or in the soil (winter).

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 420, 421.

B. OTHER IMPORTANT CELERY PESTS.

LEPIDOPTERA.

Pyralidæ.

**Pionea forficalis* Linnæus and **P. ferrugalis* Hübner; Europe. (See Cabbage.)

DIPTERA.

Agromyzidæ.

**Phytomyza affinis* Fallen. (See Tobacco.)

CHERRY.

(See Plum.)

CHESTNUT.

(*Castanea* spp. Family Cupuliferæ.)

Deciduous trees and shrubs of America, Europe, Asia, and North Africa, producing edible nuts. The coarse-grained wood is much used for furniture, railway ties, and fence posts, as it is very durable in the soil.

A. BETTER KNOWN CHESTNUT INSECTS LIKELY TO BE IMPORTED.

Curculio elephas Gyll. (*Balaninus*).

(Chestnut Weevil. Curculionidæ; Coleoptera.)

Host: Chestnut.

Injury: To chestnut fruit. Not easy to introduce.

Description and biology.—*Adult* length 6–7.5 mm. A long egg-shaped beetle, reddish yellow brown and covered with whitish scales. *Pupates* in ground. *Larva* feeds in fruit of chestnut. *Eggs* placed by female in nut.

Distribution: Europe.

HENSCHER, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 91.

Laspeyresia splendana Hübner. (*Carpocapsa*.)

(Nut Fruit Tortrix. Tortricidæ; Lepidoptera.)

Hosts: Chestnut; walnut; acorns.

Injury: Attacks the nuts, often quite destructive.

Description and biology.—*Adult* wing expanse 12–18 mm.; forewings whitish gray; basal patch gray, streaks of gray along costa; a large blackish brown area inclosing a silver-edged ocellated patch, in which are three or four black, longitudinal lines. Occurs in June and July. *Pupation* similar to that of codling moth. *Larva*, pinkish white; leaves fruit late in fall. *Eggs* deposited on young fruit, hatching in 10 days. (See text fig. 30.)

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 309.

B. IMPORTANT CHESTNUT INSECTS.

HEMIPTERA.

Coccidæ.

Unarmored.

Lecanium pulchrum King; Germany, France.

COLEOPTERA.

Anobiidæ.

Xestobium rufovillosum DeGeer; Europe; bores in wood.

Bostrychidæ.

Bostrychus capucinus Linnæus; Europe; bores in lumber and barrel staves.

Scarabæidæ.

Melolontha hippocastani Fabricius and *M. melolontha* Linnæus; Europe; larvæ injure roots of seedlings.

Cerambycidæ.

Callidium æneum DeGeer; Germany; bores in wood of felled trees and lumber.

Chrysomelidæ.

Pseudocolaspis indica Baly; India; adults destructive to inflorescence of *Castanea vesca*.

Scolytidæ, Ipidæ.

Anisandrus dispar Fabricius; Germany; galleries in wood.

Dryocætes villosus Fabricius; Germany; galleries in bark.

Scolytus mali Bechst.; Europe; galleries in cambium.

LEPIDOPTERA.

Tineidæ.

Tischeria complanella Hübner; Europe; leaf miner on *Castanea vesca*.

Tortricidæ.

Tortrix viridana Linnæus; Europe; feeds on buds and leaves of *Castanea vulgaris*.

Laspeyresia grossana Haworth; Europe. (See Beech.)

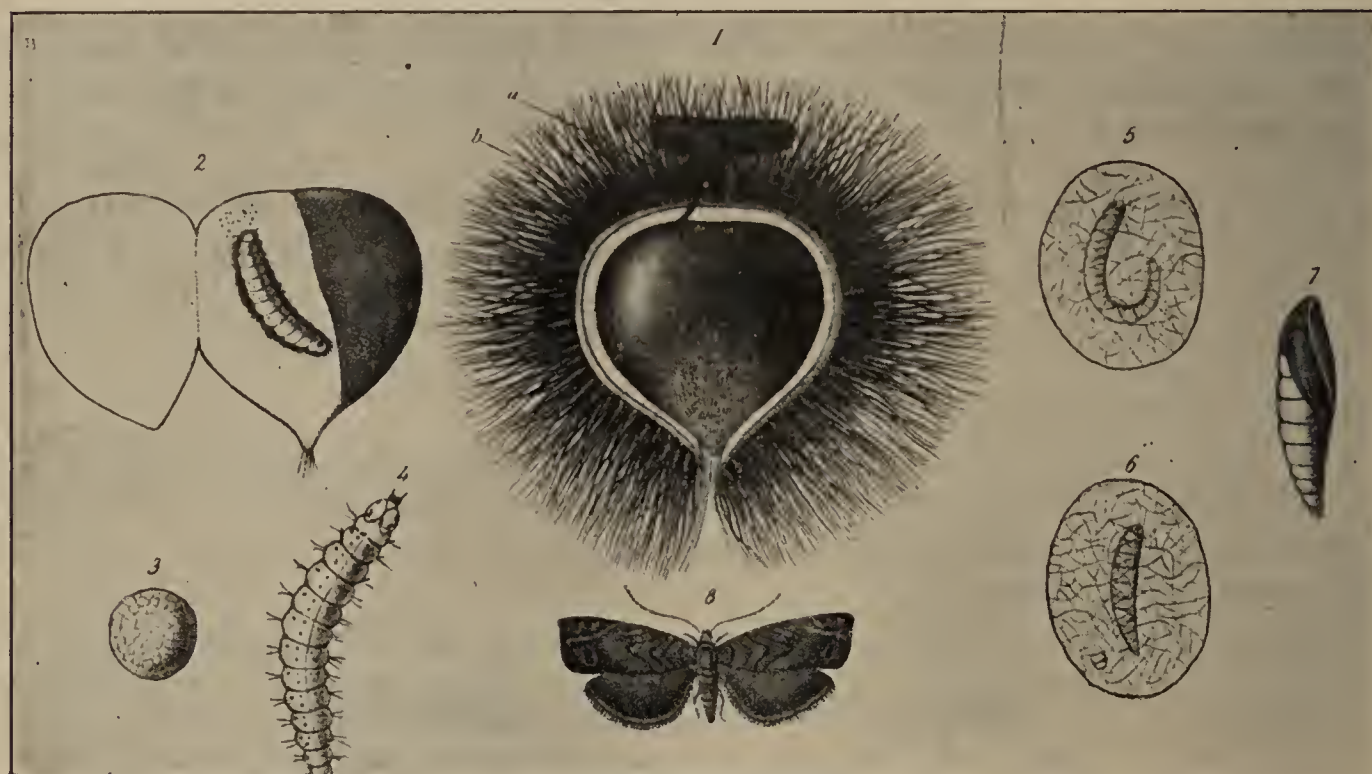


FIG. 30.—Nut fruit tortrix (*Laspeyresia splendana*): 1. Position of egg in chestnut stem; 2, larva in nut; 3, eggs; 4, larva; 5, larva in cocoon; 6, pupa in cocoon; 7, pupa; 8, adult. (Costa.)

LITERATURE.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

HESS, R. Der Forstschutz, 1898, 1900.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

CHICORY; SUCCORY.

(*Cichorium intybus* Linnæus. Family Compositæ.)

The greater part of the chicory root used in this country is imported from Europe, although a small quantity is raised in the United States. Importations of roots might very easily introduce pests.

CHINABERRY; UMBRELLA TREE.

(*Melia azedarach*. Family Meliaceæ)

The common chinaberry tree of the South originated in India. It has been introduced into the Imperial Valley, California.

COLEOPTERA.

Platystomidæ (Anthribidæ).

**Aræccerus fasciculatus* DeGeer; a cosmopolitan insect, breeds commonly in the berries. This is a pest of many dried vegetable products and is very injurious in the Southern States.

CHOCOLATE.

(See Cacao.)

CINCHONA; QUININE.

(*Cinchona*. Family Rubiaceæ.)

South American trees whose bark yields the quinine of medicine.

A. AN IMPORTANT CINCHONA PEST.

Boarmia crepuscularia Hübner.

(Javan *Cinchona* Geometrid. Geometridæ; Lepidoptera.)

Hosts: Cinchona ledgeriana; elm.

Injury: Very injurious to cinchona in Java; attacks elm in Russia.

Description and biology: The larva attacks not only the foliage, but the bark of twigs and young branches, absolutely defoliating a tree when serious.

Distribution: Java, Europe, Asia.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 338.

B. OTHER CINCHONA INSECTS.

LEPIDOPTERA.

Cossidæ.

Zeuzera coffeæ Nietner; Orient. (See Coffee.)

Psychidæ.

Clania variegata Snellenhøeven, and *C. crameri* Westwood; Orient. (See Tea.)

Lasiocampidæ.

Odonestis plagifera Walker; Java; defoliator.

Metanastria hyrtaca Cresson; Java, very important defoliator.

Lymantriidæ.

Euproctis flexuosa Snellenhøeven; Orient; defoliator.

CITRUS; ORANGE; LEMON; KUMQUAT; LIME; TANGERINE; GRAPEFRUIT.

(*Citrus* spp. Family Rutaceæ.)

Aromatic, glandular shrubs and trees cultivated in semitropical and tropical countries for their delicious fruits.

A. CITRUS PESTS LIKELY TO BE IMPORTED.

* *Eriophyes oleivorus* Ashmead.

(Orange Rust Mite; Lemon Silver Mite. Eriophyidæ; Acarina.)

Hosts: Orange, lemon.

Injury: Blisters the leaves and fruit.

Description and biology: Four-legged blister mite which attacks citrus trees and causes rusts on the fruit.

Distribution: North America, South America, Bermudas, Australia.

MARLATT, C. L. U. S. Dept. Agr., Yearbook, 1900, pp. 285-289.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 121.

Bemisia giffardi Kotinsky (**Aleyrodes**).

(Giffard White Fly. Family Aleyrodidae; Hemiptera.)

Host: Citrus.*Injury*: Frequently abundant on citrus leaves, exuding honeydew copiously, which forms a medium for the development of sooty fungus.*Description and biology*: Adult female about 0.69 mm. long. Pupa case greenish with purplish red eyes, about 1.26 mm. long and 0.63 mm. wide. Eggs uniformly dark brown in color, with apparently no pedicel.*Distribution*: Hawaii. (Supposedly an introduced species.)KOTINSKY, J. Bd. Agric. and Forestry, Hawaii, Div. Entom., Bul. 2, 1907, p. 94.
QUAINTANCE AND BAKER. Journ. Agric. Research, Vol. VI, p. 459 (1916).**Aleurocanthus woglumi** Ashby.

(Spiny citrus white fly. Family Aleyrodidae; Hemiptera.)

Hosts: Orange, *Capparis roxburghi*, *Capparis pedunculatus*, *Citrus* sp., *Morus* sp., *Salacia reticulata*, *Kurrimia zeylanica*, *Guaiacum officinale*, and *Cestrum nocturnum*.*Injury*: Infests the lower surface of the leaves.*Description and biology*: Immature stages black, spiny. Pupa case about 1.4 by .89 mm., elliptical; dorsum attached; eggs very small yellowish, sometimes reticulated.*Distribution*: India, Ceylon, Philippine Islands, Jamaica, Bahama and Cuba.**Aleurothrixus porteri** Quaintance and Baker.

(Porter's white fly. Family Aleyrodidae; Hemiptera.)

Hosts: Orange, Solanaceous plants, *Schinus dependens*, *Schinus molle*, Jaboticaba, *Lippia citriodora*, and *Myrtus*.*Injury*: Infests the lower surface of foliage.*Description and biology*: Pupa case .88 by .50 mm., elliptical; dorsum somewhat elevated, covered with cottony wax; the abdomen with a distinct keel; margin incised. Adults yellow with dark brown eyes. Length, .88 mm., forewing 1.04 mm. long, without markings, but often uniformly clouded with dusky.*Distribution*: Chile and Brazil.**Apate monachus** Fabricius.

(Bostrychidae; Coleoptera.)

Hosts: Orange, plum, almond, coffee, avocado.*Injury*: Very injurious. Bores in wood.*Description and biology*: Larva bores in bark and heartwood; sap and twigs in neighborhood of galleries blackened.*Distribution*: East and West Africa, Antilles, Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 490.

Leptostylus præmorsus.

(Bark-borer. Cerambycidae; Coleoptera.)

Host: Citrus trees.*Injury*: Attacks the stems near the ground or at the point of pruning, resulting in the ultimate death of the tree. May be introduced in nursery stock.*Description and biology*: Adult brownish with long slender antennæ. Eggs are quite likely laid in dead or dying portions of tree after pruning.*Distribution*: Lesser Antilles.

BALLOU, H. A. Insect Pests of the Lesser Antilles, 1912, p. 81.

Prays citri Miller.

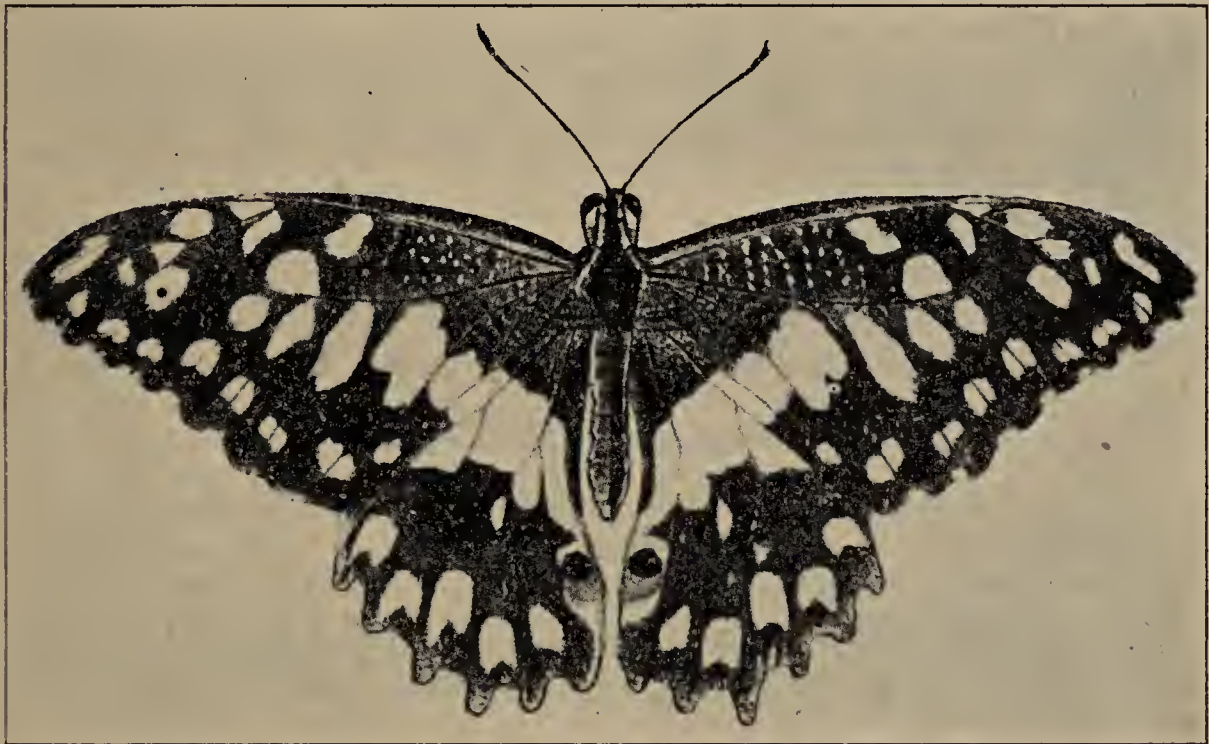
(Philippine Orange Moth. Hyponomeutidæ; Lepidoptera.)

Host: Orange, lemon, lime, mandarin, and cabuyao.*Injury:* Injures the blossoms of orange and lemon.*Biology:* Eggs deposited in the calices or peduncle of the flower; larvæ upon hatching bore through the inclosing parts, often destroying the calyx, pistil, and ovules; pupate within the flower and also in leaves or forks of twigs or branches. C. F. Baker states that in the Philippine Islands "the larva of this moth lives just beneath the rind next to, but not in, the pulp. They produce the gall-like tumors which remain open at the tips. The adult moths are of two sizes."*Distribution:* Sicily, Italy, Corsica, Ceylon, Australia, Philippines.

ESSIG, E. O. California State Board of Horticulture, Monthly Bul., vol. 2, 1913, No. 11, p. 722.

SILVESTRI, F. Dispense di Entomologia Agraria, 1911, p. 287.

QUAYLE, H. J. U. S. Dept. Agric., Bul. 134, 1914, p. 22.

FIG. 31.—Lemon butterfly (*Papilio demoleus*). (Maxwell-Lefroy.)

WESTER, P. J. Dept. Public Instruction, Bur. Agric., Manila, P. I., 1913, Bul. 27, p. 60.

Papilio demoleus Linnaeus.

(Lemon caterpillar. Papilionidæ; Lepidoptera.)

Hosts: Orange, lime, lemon, and other citrus trees.*Injury:* Defoliates citrus trees and is one of the commonest butterflies in India.*Biology:* Eggs yellow and deposited on topmost shoots of the plant. On hatching the larvæ are brown with white markings; when fully grown the color changes to a vivid green with lateral brown markings. Pupate on the plant. Adults large and conspicuous. (See text fig. 31.)*Distribution:* India and South Africa.

MAXWELL-LEFROY, H. The Agric. Journ. of India, 1908, vol. 3, p. 239.

MAXWELL-LEFROY, H. Indian Insect Pests, 1906, p. 174.

Nephopteryx sagittiferella Moore.

(Perak Pomelo Moth. Phycitidæ; Lepidoptera.)

Hosts: Pomelo, lime, lemon.*Injury:* Reported to be very destructive to pomeloes in the residency gardens at Kwala Kangsa. May be introduced in the soil.

Biology: Eggs laid singly on underside of fruit; caterpillars, on hatching, penetrate fruit, increasing size and number of galleries as each successive stage is passed; pupate in ground and emerge as adults in about 12 days.

Distribution: India, Europe (?).

COTES, E. C. Indian Museum Notes, 1891, vol. 2, No. 1, p. 21.

***Phyllocnistis citrella* Stainton.**

(Citrus Leafminer. Tineidæ; Lepidoptera.)

Hosts: Citrus.

Injury: Injurious to citrus nursery stock in India, attacking the buds and young foliage. May be introduced in nursery stock in Wardian cases.

Description and biology: *Adult*, head, face, palpi, and legs white, antennæ whitish, anterior wings white with two slender gray streaks, posterior wings whitish with pale gray cilia. *Larvæ* mine the leaves of young nursery stock, the cocoon is usually placed at the edge of the leaf, which is rolled up.

Distribution: India, Philippine Islands.

WOGLUM, R. S. U. S. Dept. of Agric., Bur. Entom., Bul. 120, 1913, pp. 27, 28, and 40.

***Ceratitis catoirei* Guérin.**

(Mauritius Fruit Fly. Trypetidæ; Diptera.)

Host: Tangerine.

Injury: Attacks fruit.

Description: Adult female fly 6–7 mm. long; male 5–6 mm.

Distribution: Seychelles Islands, Mauritius; Isles of Bourbon.

FROGGATT, W. W. Proc. Linn. Soc., New South Wales, 1910, vol. 35, pt. 4, p. 864.

***Dacus æqualis* Coquillett.**

(Large Australian Fruit Fly. Trypetidæ; Diptera.)

Host: Orange.

Injury: Larvæ feed on oranges.

Description: Adult female length 8–9 mm. (excluding ovipositor). Front margin of wings with broad ferruginous stripe. Antennæ long, and body wasp-shaped.

Distribution: New South Wales.

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bul. 24, 1909, p. 26.

***Dacus ornatissimus* Froggatt.**

(Mandarin Fruit Fly. Trypetidæ; Diptera.)

Host: Mandarin.

Injury: Breeds in fruit.

Description: Adult female 6 mm. in length, general color chestnut brown to ochreous, dorsal surface of thorax black, abdomen ochreous with narrow dark indistinct transverse lines. (See plate XXVIII, figs. a, c.)

Distribution: New Caledonia.

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bul. 24, 1909, p. 28.

IMPORTANT CITRUS INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Aspidiotus (Aonidiella) subrubescens Maskell; New South Wales. Scale of female reddish brown, flat, subcircular, exuvia central forming a slightly elevated boss.

Aspidiotus (Chrysomphalus) albopictus Cockerell; Mexico. Scale of female 2–2.25 mm. in diameter, dark brown and often covered with a white secretion, exuvia central and free of secretion.

Aspidiotus (Chrysomphalus) koebelei Townsend and Cockerell; Mexico. Scale of female 1.5–2 mm. in diameter, circular to suboval, light brown to grayish, exuvia to one side.

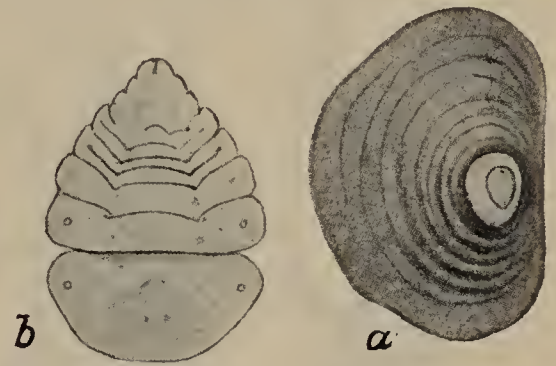
Aspidiotus (Chrysomphalus) personatus Comstock; Bermuda. (See Olive.)

Coccidæ—Continued.**Armored—Continued.**

- Aspidiotus (Chrysomphalus) scutiformis* Cockerell; Central America, Mexico. Scale of female large, flat, occasionally nearly white, exuvia orange colored and not nipplelike.
- Aspidiotus (Diaspidiotus) orientalis* Newstead; Cuba, *Poncirus trifoliata* (Citrus). Scale of female 1.6–2 mm. in diameter, subcircular, light yellowish brown, exuvia central.
- **Aspidiotus (Pseudaonidia) articulatus* Morgan; Barbados (Windward Islands), British Guiana, Costa Rica, Porto Rico, Panama, Ecuador, Venezuela, Nicaragua, Isle of Pines, Trinidad, Cuba, Sicily, Mexico, St. Vincent, Dominica. (See Coffee.)
- Aspidiotus (Pseudaonidia) clavigera* Cockerell; Hawaii. Scale of female 2.5 mm. in diameter, blackish and usually covered by epidermis of the twigs.
- Aspidiotus (Pseudaonidia) duplex* Cockerell. Scale of female 2.66 mm. in diameter, subcircular, dark blackish brown, exuvia orange colored and to one side.
- Aspidiotus (Pseudaonidia) fimbriatus* Maskell; New South Wales. Scale of female 1.5 mm., flat, thin and circular.
- Aspidiotus (Pseudaonidia) trilobitiformis* Green; East Africa, Japan, Brazil. Scale of female 3–4.5 mm. in diameter, semicircular, reddish brown. (See text fig. 32.)
- Lepidosaphes pinnæformis* Bouché; German East Africa, Canary Islands, Sicily. Scale of female 1.75–2 mm. long, yellowish brown to dusky brown, curved or mytiliform.
- Parlatoria calianthina* Berlese and Leonardi; Italy, Sicily. (See Olive.)
- Parlatoria cinerea* Doane and Hadden; Society Islands on orange. Scale of female circular, slightly convex, pale brownish gray.
- Parlatoria sinensis* Maskell; China on orange. Scale of female usually encrusting twigs.
- **Parlatoria zizyphus* Lucas; Italy, Sicily, Philippines. Often received on imported lemons. Scale of female black.

Unarmored—

- Akermes punctatus* Cockerell; Grenada; *Citrus medica acida*. Female scale about 3.5 mm. long, hemispherical, pale ochreous.
- Coccus viridis* Green; West Indies, Ceylon, Montserrat. (See Coffee.)
- Coccus hesperidum* Linnaeus; cosmopolitan; citrus, tea, palm. (See pl. II, fig. 4.)
- Icerya montserratensis* Riley and Howard; Ecuador, Montserrat, Porto Rico. Female reddish yellow, antennæ and legs black, waxy secretion white, corrugated long wax tufts protrude from the body.
- Icerya seychellarum* Westwood; Seychelles Islands, Mauritius, Madeira, Japan, Madagascar. Female about 5 mm. in length, egg sac snow white, many long silvery hairs on dorsal aspect.
- Orthezia prælonga* Douglas; Jamaica, Trinidad, Brazil, British Guiana. Female long, narrow, pitchy black and covered with snow-white waxy laminations.
- **Orthezia insignis* Douglas; cosmopolitan; citrus, tea, etc. (See pl. IV, fig. 2.)
- Pseudococcus filamentosus* Cockerell; Jamaica, Japan, Mauritius, Hawaii. Female about 3 mm. long, gray, covered with white secretions, antennæ 7-jointed.
- **Pseudococcus citri* Risso; citrus, coffee, tobacco, cotton. (See pl. II, fig. 3.)
- Pulvinaria aurantii* Cockerell; Japan. Female usually on underside of leaf, with white ovisac about 5 mm. long, suboval.
- Pulvinaria cellulosa* Green; Ceylon. Female including ovisac 4.5 to 5 mm. in length, ovisac snow white; female shrivels after gestation.
- Takahashia citricola* Kuwana; Japan. Female free from the plant and resting upon the ovisac. Similar to *T. japonica*.

FIG. 32.—Citrus scale (*Aspidiotus* [*Pseudaonidia*] *trilobitiformis*).**ISOPTERA.****Termitidæ.**

- Termes australis* Hagen; Australia. (See Apple.)

COLEOPTERA.**Scarabæidæ.**

- Adoretus umbrosus* Fabricius, and var. *tenuimaculatus* Waterhouse; Hawaii, Philippines, Japan, Java.

Bostrychidæ.

- Bostrychopsis jesuita* Fabricius; Australia; bores in trees.

Cerambycidæ.

- Uracanthus cryptophagus* Olivier; Australia; bores in trunks.
- Acrocinus accentifer* Olivier; Brazil; bores in trunks of orange, tangerine, limes, lemons. (Boletim Agricultura, ser. 15, pp. 1066–1072.)
- Diploschema rotundicolle* Serville; Brazil; girdles and bores in twigs (Bol. Agric., ser. 15, pp. 1073–1081).

Curculionidæ.

Orthorrhinus cylindrirostris Fabricius; Australia; bores in wood (French, Handbook Destr. Ins. Victoria, pt. 4, p. 82).

Cratosomus reidi Kirby; Brazil; bores long tunnels in stems and trunks of orange. (Bol. Agric., ser. 15, pp. 1081-1092.)

Diaprepes abbreviatus Linnæus; West Indies. (See Sugar cane.)

LEPIDOPTERA.

Pyalidæ.

Dichocrocis punctiferalis Guénée; Queensland. (See Corn.)

Papilionidæ.

Papilio idæus Fabricius; Brazil; feeds on foliage.

DIPTERA.

Trypetidæ.

Anastrepha fraterculus Wiedemann, attacks oranges. (See Fruit.)

Anastrepha ludens Loew; Mexico; attacks orange and sweet lime. (See Fruit.)

Bactrocera tryoni Froggatt; Orient. (See Fruit.)

Ceratitis capitata Wiedemann, attacks *Citrus aurantium*, *C. grandis* (*decumana*), *C. japonica*, *C. limonia* and *C. nobilis*. (See Fruit.)

Dacus ferrugineus Fabricius; India, etc. (See Fruit.)

Dacus diversus Coquillett; India. (See Fruit.)

Dacus passifloræ Froggatt; Fiji; attacks orange, lemon, and lime. (See Fruit.)



FIG. 33.—The clover-root curculio (*Sitona hispidula*): Adult, larva and pupa. Greatly enlarged (Wildermuth.)

CLOVER.

(*Trifolium* spp. Family Leguminosæ.)

There are many species of clovers used as forage crops in various parts of the world. Although clover is usually only imported as seed, several very serious foliage pests have been introduced from Europe.

The lasiocampid moth, *Lasiocampa trifolii* Ep., of Europe and Asia Minor, is injurious to clover. Many weevils of the genus *Sitona* not mentioned below are injurious to clover in Europe. They breed at the roots, but several have been imported into the United States. The weevils of the genus *Hypera* (*Phytonomus*) are equally dangerous to clovers. They breed externally on the foliage. Several European species have established strong colonies in this country. The weevils of the genus *Apion* (e. g. *A. apricans* Herbst) often breed in the heads of clovers and many of them are very dangerous. (For *Agriotes lineatus* Linnæus see Tobacco.)

***Sitona* spp.**

(Clover root weevils. Curculionidæ; Coleoptera.)

Species. *S. lineata* Linnæus; Europe (England); adults feed on peas, beans, etc., larvæ feed at roots of these and clover and lucerne. **S. flavescens* Marsh.; Europe, introduced into America; clover, beans, peas, *Galega officinalis*. **S. hispidula* Fabricius; Europe, introduced into America; clover, peas, *Galega officinalis*. (See text fig. 33.) *S. linneellus* Gyllen-

hal; Europe; lucerne. *S. meliloti* Walton; Europe, *Melilotus officinalis* Derr. *S. sulcifrons* Thunberg; Europe; clover, *Atriplex hastata* L.

Description: Elongate grayish or brownish weevils with short blunt beak. The larvæ breed at the roots of plants and in nodules. Important pests.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887.

* *Miccotrogus picirostris* Fabricius.

(Imported clover weevil. Curculionidæ; Coleoptera.)

This is a recently imported weevil which attacks clover in New England. (See text fig. 34.)

Hypera (Phytonomus) spp.

(Clover-leaf weevils. Curculionidæ; Coleoptera.)

Species: **H. punctata* Fabricius; Europe, introduced into America; clover, and alfalfa. **H. meles* Fabricius; Europe, introduced into America; clover, alfalfa, grasses. **H. nigrirostris* Fabricius; Europe; introduced into United States; clover, alfalfa, *Ononis*, etc. *H. miles* Paykull, Europe; clover. *H. murina* Linnæus; Europe; alfalfa, clover. *H. variabilis* Herbst; Europe; clover, beans, cabbage, raspberry, potato. *H. ononidis* Chevrolat; Europe; clover, *Ononis viscosa*.

Injury: These are all serious or potential pests and easily distributed. (See Alfalfa.)

Description and biology: The clover-leaf beetle, *H. punctata*, is very familiar to most entomologists in this country. The other species are of similar form but different colors of brown, gray, or green. The larvæ feed externally on the leaves and pupate in silken cocoons.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887.

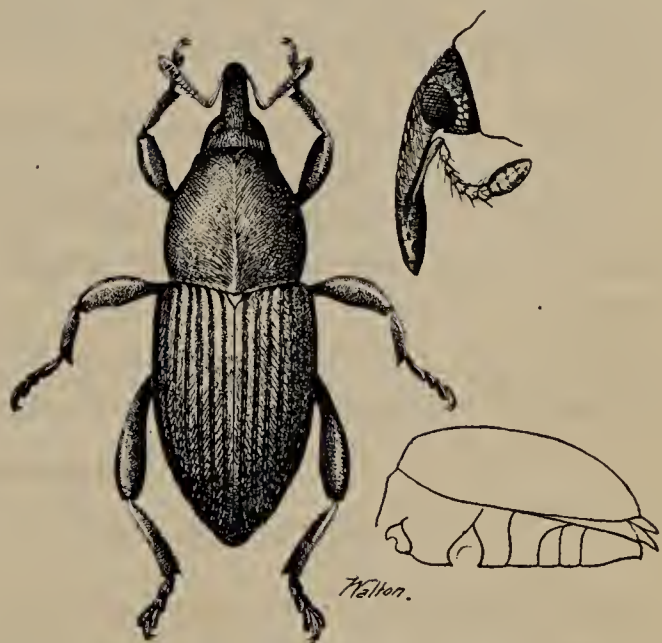


FIG. 34.—Imported clover weevil (*Miccotrogus picirostris*): Adult, enlarged. (Original, Walton.)

COCONUT PALM.

(*Cocos nucifera*. Family Palmaceæ.)

A large palm cultivated for ornament and for its edible fruit. It is grown in Florida and California as an ornamental tree. (See Palms.)

COFFEE.

(*Coffea arabica* Linnæus; *Coffea liberica* Hiern. Family Rubiaceæ.)

Coffee is grown in Africa, Asia, Central America, South America, and many of the islands of the Pacific and Atlantic. Although not grown in the United States proper, it is an important product of Porto Rico, Hawaii, and the Philippines. The importations of the beans into this country are enormous. Where beans or seedlings are imported into the Territories above mentioned, there is danger of introducing noxious insects.

A. BETTER KNOWN COFFEE INSECTS.

Tetranychus bioculatus Wood-Mason.

(Coffee Red Spider. Tetranychidæ; Acarina.)

Host: Coffee, tea, tomato, *Firmiana colorata*, *Anthocephalus cadamba*.*Injury*: Injures plant by sucking juices. May be easily imported on nursery stock and might attack other crops if introduced.*Description and biology*: A tiny red spider very like the common red spider of this country and likely to be as dangerous.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 97.

COTES, E. C. Indian Museum Notes, 1896, vol. 3, pp. 48-56, 2 figs.

Xyleborus coffeæ Wurth.

(Coffee Beetle. Scolytidæ; Coleoptera.)

Hosts: *Coffea arabica*, *C. robusta*, and *C. liberica*, *Erythrina lithosperma*, *Melia azedarach*, *Cacao*, *Cinchona ledgeriana*. Occasionally feeds on *Hevea brasiliensis*, although the sticky excretion of the plant catches and holds the beetles, resulting in their death.*Injury*: Considered injurious to *Coffea robusta*, and it is recommended that this plant be discontinued in order to drive the insects to bruised or injured *Hevea brasiliensis*.*Description and biology*: Adult male beetle 1.1 mm. long and 0.55 mm. broad; adult female 1.6 mm. long and 0.8 mm. broad; color shining brown. Bores in galleries in the wood.*Distribution*: Dutch East Africa, Java, Tonkin.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 574.

Zeuzera coffeæ Nietner.

(Red Coffee Borer. Cossidæ; Lepidoptera.)

Hosts: Coffee, tea, cacao, cinchona, *Acalypha marginata*, *Anona muricata*, *Duranta*, *Grevillea*, *Persea gratissima*, *Photinia*, *Santalum album*, *Swietenia mahagoni*, cotton.*Injury*: Bores in the wood or stalks.*Description and biology*: Moth wing expanse 40-46 mm., head and thorax gray, with black spots; wings white with blue black spots, abdomen black with white hair. Bores in the wood. Pupates in larval bore near exterior. The pupa emerges partially before escape of moth.*Distribution*: India, Ceylon, Java, Kamerun (German East Africa).

SORAUER, P. Handbuch der Pflanzenkrankheiten, ed. 3, vol. 3, 1913, p. 321.

MAXWELL-LEFROY, H. M. Mem. Dept. Agric. India, vol. 1, 1907, p. 156, fig. 41.

Leucoptera coffeella Stainton.

(Coffee Leaf Miner. Lyonetiidæ; Lepidoptera.)

Host: Coffee.*Injury*: Is said to have caused a loss of about 20 per cent of the crop in Brazil, 20 to 30 per cent of the leaves infested in Porto Rico, and a serious enemy in Cuba. Considered the worst of all coffee pests. Likely to be introduced on plants.*Description and biology*: Adult moth 2.5 mm. long, silver gray color, tipped with black on posterior end. Eggs deposited in small slits made in the leaves; the larvæ hatch within 4 to 6 days, live within the leaf about 3 weeks, and then leave the interior of the leaf through the upper epidermis and form a web, pupating on under surface of the leaf. The adult hatches in from 3 to 7 days.*Distribution*: Porto Rico, Brazil, Cuba.

COOK, M. T. Est. Centr. Agron. de Cuba, Bul. 3, 1905.

B. OTHER IMPORTANT COFFEE INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

**Aspidiotus (Pseudaonidia) articulatus* Morgan; Venezuela, Jamaica, British Guiana. Adult female 2-2.25 mm. in diameter, semitransparent, pale brown or yellowish.

Lepidosaphes corrugata Green; Java. Adult female, scale 3-4.5 mm. in length, 1 mm. broad, dull black, thick, opaque, with many curved transverse corrugations.

Unarmored—

Asterolecanium coffeæ Newstead; German East Africa. Liable to be introduced on leaves and twigs. Adult female, test golden yellow, margin fringed with golden yellow glassy filaments; test of old specimen opaque grayish with bottle-green markings.

Cerococcus ornatus Green; Ceylon. Liable to be introduced on twigs. Adult female enclosed in test of wax which is purplish brown, on each of the sloping sides are two wax ridges; length 2-2.5 mm.

Ceroplastes ceriferus Anderson; German East Africa. On *Coffea arabica*. (See Citrus.)

Ceroplastes vinsonioides Newstead; Uganda. Liable to be introduced on leaves and twigs. Adult female, covered with wax, test dark cinnamon to brownish, young female star shaped.

Coccus viridis Green; Brazil, Ceylon, India, Mauritius. Liable to be introduced on cuttings and foliage. Adult female 2.5 to 3.25 mm. in length, breadth 1.5 to 2 mm.; pale green with loop of blackish spots on dorsum.

Lecanium caudatus Green; Ceylon. Liable to be introduced on cuttings and foliage. Adult female 3-4 mm. in length, 2-3 mm. in breadth; oval, narrowed in front broadly rounded behind, bright, castaneous.

Ortheziola fodiens Giard; Guadeloupe. Liable to be introduced on roots. Adult female 2 mm. long, 1.5 mm. broad, tawny red provided with laminations.

Pseudococcus coffeæ Newstead; Java; Liberian coffee. Adult female covered with densely felted plates of white secretion.

Pseudococcus virgatus Cockerell; Jamaica, Mexico, Hawaii. Liable to be introduced on foliage, branches, or roots. Adult female 4-5 mm. long, white mealy brown above with caudal filaments about half the length of the body; antennæ 8-jointed.

Pulvinaria camelicola Signoret; Hawaii. Adult female 2-3 mm. in length, ovisac from four to eight times length of insect.

Pulvinaria ficus Hempel; Montserrat, Antigua, St. Kitts. Adult female length 5 mm., width 2.25 mm.; ovisac white and fluffy; antennæ 8-jointed.

Pulvinaria mammeæ Maskell. Adult female before gestation about 8 mm. long. Ovisac large, snow white, forming a mass of loose cotton.

Rhizococcus eloti Giard; Guadeloupe. Liable to be introduced on roots. Adult female elongate, anal tubercles prominent; antennæ 5-jointed.

**Saissetia nigra* Nietner; Costa Rica, Ceylon, India. Liable to be introduced on cuttings and plants. Adult female length 3-5 mm., breadth 2-3 mm.; black, oval, convex with dorsum occasionally forming a pronounced hump; a longitudinal carina is often present.

THYSANOPTERA.

**Heliothrips rubrocinctus* Giard; West Indies, Ceylon, Uganda, Florida; attacks *Coffea liberica*. (See plate X.)

COLEOPTERA.

Bostrychidæ.

Apatte monachus Fabricius; Africa, West Indies. (See Citrus.)

Cerambycidæ.

Monohammus fistulator Germar; Java, Sumatra, Borneo; bores in wood.

Biradus sierricola White; Sierra Leone to Kamerun; very serious borer.

Coptops fusca Olivier, *C. bidens* Fabricius, *Baræus sordidus* Olivier, *Sternotomis imperialis* Fabricius, *S. regalis* Fabricius, *Moecha büttneri* Kolbe, *M. molator* Fabricius, and *Frea maculicornis* Thomson; West Africa; bore in wood.

Anthores asperula White; East and South Africa; a very serious borer.

Frea marmorata Gerstaecker; East Africa.

Praonetha melanura Pascoe; Java.

Nitocris usambica Kolbe; East Africa; a very injurious borer.

Xylotrechus javanicus Lap. et Gory; Java; bores in bark and wood.

Xylotrechus quadripes Chevrolat; India, Ceylon, Burma, Siam, Tonkin, Philippines; bores in bark and wood. (See text fig. 35.)

Brachyrhinidæ (Otiorynchidæ).

Hypomeces curtus Schönherr; eats the foliage of young plants in Java.

Pachnæus litus Germar; breeds at the roots, the larvæ gnawing the bark, in Cuba.

Pachnæus azureus Gyllenhal; breeds at the roots, the larvæ gnawing the bark in Cuba.

Brachyrhinidæ (Otiorhynchidæ)—Continued.

Diaprepes abbreviatus Linnæus; attacks the foliage and possibly the larvæ attack the roots in the West Indies. (See Sugar cane.)

Cratopus punctum Fabricius; feeds on the foliage in Mauritius and Reunion.

Geonimus quadrinodosus Chevrolat; feeds as larva on the leaves in Venezuela.

Rhadinoscopus nocturnus Kolbe; feeds on the leaves in German East Africa.

Scolytidæ.

Xyleborus morstatti Hagedorn; German East Africa; bores in Bukoba coffee and *Coffea stenophylla*.

LEPIDOPTERA.

Pyralidæ.

Thliptoceras octoguttata Fld.; German East Africa; attacks beans.

Cochlidiidæ.

Parasa lepida Cr.; Java; serious.

Psychidæ.

Clania crameri Westwood and *C. variegata* Snellenhoeven; Orient. (See Tea.)

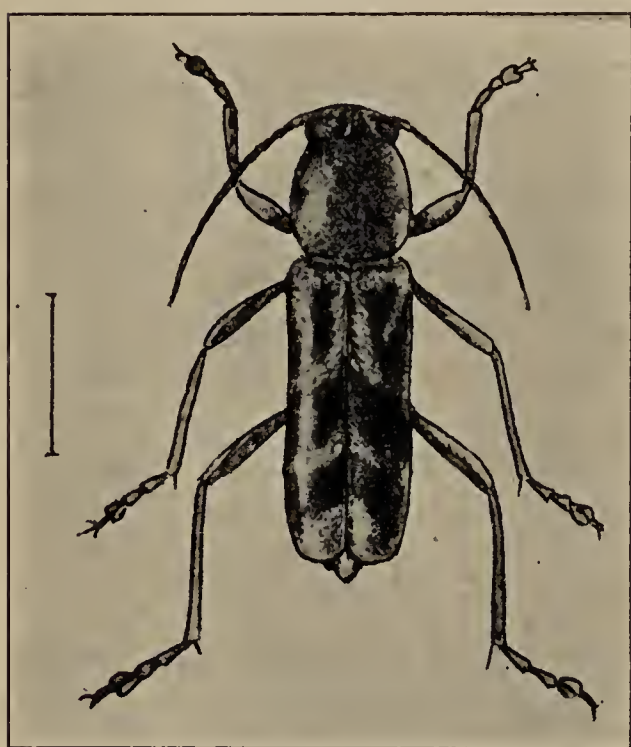


FIG. 35.—Pine bark beetle (*Xylotrechus quadripes*): Adult. (Maxwell-Lefroy.)

(*Abies*), hemlock spruce (*Tsuga*), larch (*Larix*), pine (*Pinus*), and spruce (*Picea*).

This grouping is due to the fact that these trees have so many pests in common and also because of a confusion in foreign and home literature of the names pine, spruce, and fir.

A. IMPORTANT INSECTS ATTACKING VARIOUS CONIFERS.

Diadoxus scalaris Laporte et Gory; *Diadoxus erythrurus* White.

(Cypress Borers. Buprestidæ; Coleoptera.)

Hosts: Murray pine (*Pinus frenela*), Lambert's cypress (*Cupressus lambertiana*).

Injury: Very destructive to the wood, boring under the bark and into the wood.

Description: *D. scalaris* is the larger species. Both are greenish in color, with the elytra largely reddish brown except for green basal stripes and yellow discal spots. The median line of the thorax is yellow between two black or brown fasciæ. Larvæ yellowish white.

Distribution: Victoria, Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, pt. 5, 1911, pp. 44-50, pls. 106, 107.

Lymantriidæ.

Dasychira mendosa Hübner, *D. misana* Moore, *D. thwaitesi* Moore and *Orgyia postica* Walker; India, Ceylon, Java; defoliators.

Notodontidæ.

Stauropus alternus Walker; India, Ceylon, Java; defoliates.

DIPTERA.

Trypetidæ.

Anastrepha fraterculus Wiedemann. (See Fruit.)

Ceratitis capitata Wiedemann; attacks *Coffea arabica*. (See Fruit.)

COLLARD.

See Cabbage.

CONIFERS.

(Family Pinaceæ.)

Under this heading are treated the insect pests of Douglas spruce (*Pseudotsuga*), fir

Tetropium castaneum Linnæus.(Spruce Borer. *Cerambycidæ*; *Coleoptera*.)*Hosts*: Larch, spruce, pine, fir.*Injury*: Bores in the wood.*Distribution*: Europe, Siberia.NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 136–139, figs. 108, 109 (*T. fuscus*, *T. luridus*).

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 495.

Brachyrhinus (*Otiorhynchus* spp.).(Coniferous Root Weevils. *Brachyrhinidæ* (*Otiorhynchidæ*); *Coleoptera*.)

Species: *B. niger* Fabricius; Europe; pine, larch, spruce, maple, alder, ash, service berry; breeds at the roots and the adults attack the foliage. *B. fuscipes* Olivier; Europe; spruce. *B. perdix* Olivier; Europe; spruce. **B. ovatus* Linnæus; Europe, United States; spruce. A very important pest of strawberries, conifers, and greenhouse plants. *B. singularis* Linnæus; Europe; spruce, fir, and many other plants (see Grape). *B. sensitivus* Scopoli; Europe; spruce, Weymouth pine, Douglas fir. *B. irritans* Herbst; Europe; pine, beech. *B. armadillo* Rossi, *B. aurifer* Boheman, *B. egregius* Miller, *B. fullo* Schrank, *B. inflatus* Gyllenhal, *B. jovis* Miller, *B. lepidopterus* Fabricius, *B. kratterii* Boheman, *B. morio* Fabricius, *B. multipunctatus* Fabricius, and *B. septentrionis* Herbst, are reported on conifers in Europe.

Description: Black, oval weevils, with broad blunt beaks. Breed at the roots of plants and are very destructive.

SORAUER, P. Handbuch der Pflanzenkrankheiten, ed. 3, vol. 3, 1913, p. 54.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883–1887.

Magdalis spp.(Coniferous Weevils. *Curculionidæ*; *Coleoptera*.)

Species: The weevils of this familiar genus are very destructive to forest trees, breeding under the bark but entering the wood. They are very easily distributed in logs. *M. violacea* Linnæus; Europe; attacks 3 to 10 year old pines, larch, and fir. *M. phlegmatica* Herbst; Europe; spruce and pines. *M. duplicata* Germar; Europe; spruce, *Pinus silvestris*. *M. memnonia* Gyllenhal; Europe; pine. *M. rufa* Germar; Europe; pines and other conifers.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883–1887.

Dendroctonus micans Kugelann.(The Large Bast Beetle. *Ipidæ*; *Coleoptera*.)*Hosts*: Principally spruce (*Picea*). Occasionally pine.*Injury*: Quite destructive to trees from breast height down to and including roots.

Description: Beetle elongate, nearly dull black, with long gray-yellowish hair not densely set. Wing covers punctate striate, antennæ and legs yellowish red; 8–9 mm. long.

Evidence of infestation: Free resin flow out of holes about 3 mm. in diameter. Mixed with boring dust, it hardens in the air in white lumps.

Distribution: Germany, France.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde. 1913, pp. 246–249, fig. 211.

JUDEICH, J. F., and NITSCHKE, H. Lehrbuch der Mitteleuropäischen Forstinsektenkunde. I, pp. 458–462, 1895.

Ips typographus Linnæus.

(Eight-toothed large spruce barkbeetle or "typographer." Ipsidæ; Coleoptera.)

Hosts: Spruce; rarely larch and Scotch fir (*Pinus silvestris*.)

Injury: Bores in bark and sapwood; while usually secondary, it also attacks healthy trees when very numerous. Recognized as the most dangerous bark-beetle in Europe.

Description: Beetle black or brown, cylindrical, 4.5–5.5 mm. long, 8 teeth on margins of elytral declivity, of which the 3d on each side is the largest and with rounded apex.

Evidence of infestation: Shows only when the tree begins to react by changing color of foliage.

Distribution: Lapland to Alps, wherever spruce grows.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde. 1913, pp. 269–272, fig. 238.

JUDEICH, J. F., und NITSCHKE, H. Lehrbuch der Mitteleuropäischen Forstinsektenkunde. I, pp. 506–516, figs. 167–169, 1895.

***Tomiscus (Myelophilus) piniperda** Linnæus.

(The large or black pine pith borer or "forest gardener." Scolytidæ; Coleoptera.)

Hosts: Pine.

Injury: Tunnels under bark of trunk and branches. Young adults feed on pith of 1 to 2-year old shoots. Attack sickly and quite healthy trees and invariably cause their death from above downward. Attacks thin, smooth bark of trunk and branches and heavy barked portion of lower trunk of living felled or sickly trees.

Description: Beetle elongate, 3.5–4.5 mm. long; proboscis finely and not densely punctate; elytra finely punctate-striate, posteriorly with a row of brush-bearing small tubercles.

Evidence of infestation: Fading and dying tops; long vertical galleries in bark. Twigs hollow at tip with pitch tubes at base.

Distribution: Europe.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde. 1913, pp. 243–246, figs. 207–210.

JUDEICH, J. F., und NITSCHKE, H. Lehrbuch der Mitteleuropäischen Forstinsektenkunde. pp. 462–472, figs. 145 and 146, 1895.

Bupalus piniarius Linnæus.

(Pine Geometrid. Geometridæ; Lepidoptera.)

Hosts: Pine, spruce, fir.

Injury: Feeds on foliage and young shoots.

Description and biology: Male moth bright yellow, female bright reddish brown, both marked with dark brown. Larva green, with three white dorsal lines and two yellow lateral lines.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 337.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde 2d ed., 1913, pp. 385–390, figs. 315–317.

Dasychira selenitica Esp.

(Larch Tussock Moth. Lymantriidæ; Lepidoptera.)

Hosts: Larch, pine, sainfoin, herbs, hardwoods.

Injury: Defoliator, especially injurious to young trees.

Description and biology: Moth brown; male olive brown; female brownish black, with white crescent and wavy line on wings. Larva black, with dark-gray hairs on black

warts, and the fourth to eighth segments each with a yellowish gray brush of hairs tipped with black; first segment with black hair pencil, eleventh segment with two. Pupates on surface of ground in a cocoon.

Distribution: Germany.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 384.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 1913, 2d ed., p. 376.

***Laspeyresia duplicana* Zetterstedt.**

(Fir Bark Tortricid. Tortricidæ; Lepidoptera.)

Hosts: White fir (*Abies pectinata*), juniper (*Juniperus*), spruce (*Picea excelsa*).

Injury: Breeds in the bark and possibly sometimes the twigs.

Description and biology: Moth 15–16 mm. in wing expanse; forewings dark brown, with a white crescentiform spot at middle and finer markings beyond. The larva breeds from fall to spring under bark. Its life history is not definitely worked out.

Distribution: Europe (Germany).

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 411, 412, fig. 343.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 281.

HESS, RICHARD. Der Forstschutz, 1898, vol. 1, pp. 485, 486, fig. 173.

****Enarmonia pinicolana* Zell.**

(Gray Larch Moth. Tortricidæ; Lepidoptera.)

Hosts: *Larix*, *Abies*, Siberian stone pine (*Pinus cembra* L.).

Injury: Attacks the needles.

Description and biology: Moth, wing expanse 18–22 mm., forewings shining light gray with brown markings. Larva dark green with darker stripes, head and thoracic shield black. Feeds under webs on the needles.

Distribution: Europe, Siberia, North America, but serious only in Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, v. 3, p. 286.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 419–422, figs. 354–355.

B. OTHER GENERAL CONIFEROUS PESTS.

HEMIPTERA.

Aphididæ.

**Mindarus abietinus* Koch, a plant louse; Europe; attacks young shoots of *Abies pectinata* and bark of *Picea*.

Phylloxeridæ.

Pinus sibiricus Cholodkovsky; a gall louse; Russia; attacks *Pinus cembra* and *Picea* in alternating generations.

Pinus orientalis Dreyfus and *P. pini* Koch; Europe; attack *Picea orientalis*, *P. excelsa*, *Pinus montana*, *P. silvestris*, and *P. strobus*, its generations alternating on pine and fir.

Pinus strobi Hartig, gall louse; Europe; attacks *Pinus strobus*.

Aphrastasia pectinatæ Cholodkovsky; gall louse; northeast Europe; attacks *Abies* and *Picea*.

Dreyfusia nuesslini C. B.; gall louse; Europe; attacks *Abies nordmanniana* and *Picea*.

**Dreyfusia piceæ* Ratzeburg; gall louse; Europe; attacks stems of *Abies pectinata*.

Chermes viridis Ratzeburg, a gall louse; Europe; attacks *Larix* and *Picea*.

**Chermes abietis* Kaltenbach, a gall louse; Europe; attacks *Larix*, *Abies pectinata*, *Pinus cembra*, *P. silvestris*.

Cnaphalodes strobilobius Kaltenbach; gall louse; Europe; attacks *Larix* and *Abies*.

Cnaphalodes lapponicus Cholodkovsky; Europe; attacks *Picea* and *Larix*.

COLEOPTERA.

Melandryidæ.

**Serropalpus barbatus* Schall.; Europe; bores in the bark and wood of *Abies pectinata* and *Picea*.

Bostrychidæ.

Apate molle Linnæus; Europe; bores in bark-stripped wood of conifers.

Buprestidæ.

Anthaxia quadripunctata Linnæus; Germany; bores in stems of young trees and branches of older trees of spruce (*Picea*).

Elateridæ.

Agriotes aterrimus Linnæus, *A. lineatus* Linnæus, and *A. obscurus* Linnæus; Europe; attack the seedlings and roots of pine, fir, and spruce, while some species attack larch.

Dolopius marginatus Linnæus; Europe; attacks the roots of seedling and yearling fir, pine, and spruce.

Selatosomus æneus Linnæus; Europe; attacks roots of pine, fir, and spruce.

Tenebrionidæ.

Setenis semiopaca Blair; India; breeds in the trunks of *Picea morinda* and *Pinus excelsa*.

Cerambycidæ.

* *Hylotrupes bazulus* Linnæus; Europe; bores in the finished lumber, especially building timbers and furniture of coniferæ.

Monohammus sartor Fabricius and *sutor* Linnæus; Europe; attack bark and wood of fir and spruce.

Pogonochærus fasciculatus De Geer; Europe (Germany); bores in the wood of spruce, pine, and fir.

Tetropium castaneum Linnæus; Europe; bores in the wood of larch, spruce, pine, and fir.

Brachyrhinidæ (Otiorhynchidæ).

Metallites atomarius Olivier, *M. laricis* Chevrolat, *M. mollis* Germar; weevils; Europe; as adults injure the buds of conifers; the larvæ breed at the roots of trees.

Brachyrhynchus subsignatus Faust; a weevil; India; adult causes very serious defoliation of *Abies webbiana* and *Picea morinda*.



FIG. 36.—Coniferous bark weevil (*Pissodes notatus*): Adult, larva, pupa, injury. (Henschel.)

Curculionidæ.

Hylobius abietis Linnæus, *H. fatuus* Rossi, and *H. piceus* De Geer; Europe; breed in the bark and wood of conifers. These are very important weevils.

Pissodes harcynix Herbst, *P. notatus* Fabricius, *P. piceæ* Illiger, *P. pini* Linnæus, and *P. piniphilus* Herbst; weevils; Europe; breed under bark of pines, spruce, and fir. (See text fig. 36.)

Cossonidæ.

Rhyncolus ater Linnæus, *R. elongatus*, *R. porcatus* Germar, *R. lignyarius* Marsh., *R. strangulatus* Peris, *R. truncorum* Germar, and *R. cylindricus* Boheman; Europe; bore in the trunks and rotten wood of pines, spruce, and fir.

Rhyncolus himalayensis Stebbing; India; bores in the wood of *Pinus excelsa* and *Picea morinda*.

Ipidæ.

- Cryphalus abietis* Ratzeburg; Europe; attacks fir (*Abies pectinata*), spruce (*Picea excelsa*), and pine.
Cryphalus saltuarius Weiss; Europe; attacks young fir, spruce, and pine.
Cryphalus boswelliæ Stebbing; India; attacks spruce and *Pinus longifolia*.
Cryphalus piceæ Ratzeburg; Europe; attacks *Abies pectinata* and larch.
Crypturgus pusillus Gyllenhal; Germany; attacks spruce, fir, pine (*Pinus strobus* and *P. pinaster*). and larch. In the Himalayas this species attacks *Pinus excelsa* and *Picea morinda*.
Dryocoetes autographus Ratzeburg; Germany; attacks spruce, fir, and pine (*Pinus strobus*).
Hylastes attenuatus Erichson; Germany; attacks pine and spruce.
Hylastes decumanus Erichson; Europe; attacks spruce and *Pinus cembra*.
Hylastes himalayensis Stebbing; India; attacks *Picea excelsa*.
Hylurgops palliatus Gyllenhal; Europe; attacks *Pinus silvestris*, *P. strobus*, *P. pinea*, *P. austriaca*, *P. maritima*, larch, and spruce.
Ips amitinus Eichhoff; Europe; attacks spruce, pine, fir, and larch.
Ips cembra Heer; Europe; attacks larch and *Pinus cembra*.
Ips duplicatus Sahlberg; Finland and Ural; spruce and pine.
Ips sexdentatus Boerner; Europe; spruce and pine (*Pinus austriaca* and *P. pinaster*).
Ips ribbentropi Stebbing; India; *Pinus excelsa* and *Picea morinda*.
**Ips typographus* Linnæus; Europe; attacks spruce, larch, Scotch fir (*Pinus silvestris*).
Tomicus (Myelophilus) minor Hartig; Europe; attacks pine and spruce.

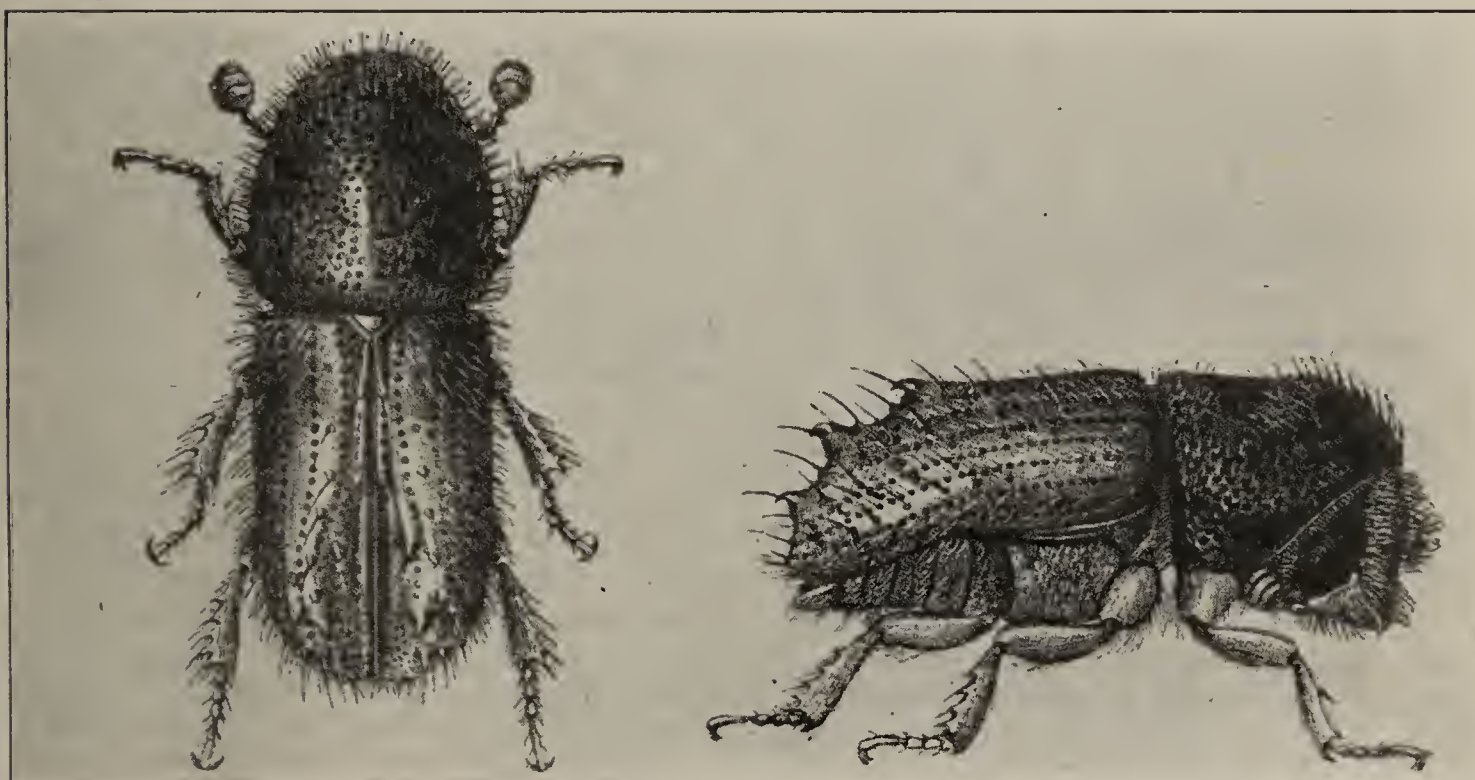


FIG. 37.—Barkbeetle (*Pityogenes chalcographus*). (Eckstein.)

- **Tomicus (Myelophilus) piniperda* Linnæus; Europe to Japan; pines, larch, spruce.
Orthotomicus suturalis Gyllenhal; Europe; spruce, fir (*Picea excelsa*), pine (*Pinus austriaca* and *P. silvestris*).
Orthotomicus laricis Fabricius; Europe; attacks fir (*Abies pectinata*), larch, spruce, pine (*Pinus silvestris*).
Orthotomicus proximus Eichhoff; Europe; thin bark of upper stems of pine and spruce.
Pityogenes bidentatus Herbst; Europe; larch, spruce, and pine (*Pinus austriaca*, *P. strobus*, *P. pinaster*, *P. silvestris*).
Pityogenes bistridentatus Eichhoff; Germany, France; pine, fir.
Pityogenes chalcographus Linnæus; fir (*Abies pectinata*), spruce (*Picea excelsa*), pine (*Pinus strobus*), larch. (See text fig. 37.)
Pityogenes coniferæ Stebbing; India; blue pine (*Pinus excelsa*), Chilgoza pine (*P. gerardiana*), fir (*Picea morinda*). (See plate XI, fig. 3a-c.)
Pityogenes pilidens Reitter; Europe and Asia Minor; *Pinus austriaca* and fir.
Pityogenes quadridens Hartig; Europe; *Pinus silvestris* and Siberian spruce.
Pityokteines curvidens Germar; Europe; spruce (*Picea excelsa*), larch, balsam fir (*Abies balsamea*), pine (*Pinus silvestris*).
Pityophthorus micrographus Linnæus; Europe; attacks *Abies pectinata*, *Pseudotsuga mucronata*, *Picea excelsa*, *Pinus strobus*.
Polygraphus major Stebbing; India; *Pinus excelsa*, *Picea morinda*.
Polygraphus pini Stebbing; India; *Pinus excelsa*, *Picea morinda*.
Polygraphus polygraphus Linnæus; Europe; spruce, fir, pine (*Pinus silvestris*, *P. strobus*).

Ipidae—Continued.

- Polygraphus subopacus* Thomson; Europe; spruce, pine.
Xylechinus pilosus Knoch; Europe; pine, spruce, larch
Xyloterus lineatus Olivier; Europe; fir, spruce, pine, larch.

LEPIDOPTERA.

Lymantriidae.

- **Lymantria monacha* Linnæus; Europe; defoliator on pine, spruce, larch. (See Forests.)
Orgyia antiqua Linnæus; Europe; spruce, pine; defoliator.

Noctuidæ.

- Agrotis segetum* Schiffermiller; Europe; injures roots of seedlings and nursery stock of spruce, larch, pine.
Agrotis vestigialis Rott.; Europe; injures roots of seedlings and nursery stock of pine and larch.

Pyrilidæ.

- Euzophera cedrella* and *Phycita abietella*; India; infest cones of blue pine (*Pinus excelsa*), fir (*Picea morinda*), and silver fir (*Abies webbiana*).

Tortricidæ.

- Asthenia pygmaea* Hübner; Europe; spruce, fir; attacks needles on young shoots.
Tortrix piceana Linnæus; Europe; attacks foliage of pine and other conifers.
Enarmonia pinicolana Zell; Europe; attacks foliage of larch, pine, and spruce.
Tortrix viburniana Fabricius; Norway; attacks *Picea excelsa*, *Pinus silvestris*, *P. montana*, *Larix decidua*.

Hypnometridæ.

- Argyresthia fundella* F. R.; Europe; attacks needles of fir, spruce, and pine.

HYMENOPTERA.

Callimonidæ.

- Megastigmus strobilobius* Ratzeburg; a chalcid; Europe; breeds in seed of hemlock and fir (*Abies pectinata*).

Diprionidæ.

- Diprion pini* Linnæus; *D. rufus* Klug, and *D. pallidus* Klug; Europe; attack bark and needles
 **Diprion simile*; Europe, Connecticut. An important sawfly, recently imported.

Megalodontidæ.

- Acantholyda erythrocephala* Linnæus; sawfly; Germany; attacks foliage of pine, larch, spruce, fir.
Cephalcia hypotrophica Hartig, and *C. signata* Fabricius; Europe; attack foliage of pine, spruce, fir.
Itycorsia stellata Christ.; sawfly; Europe; pine and fir.

Siricidæ.

- Sirex juvencus* Linnæus, *S. spectrum* Linnæus, and *S. gigas* Linnæus; wood wasps; Europe; bore in wood of spruce, fir, pine, and larch.
Xeris spectrum Linnæus; wood wasp; Europe; bores in spruce and fir wood.

DIPTERA.

Tipulidæ.

- Pachyrhina crocata* Linnæus; crane fly; Germany; breeds in bark of young seedling balsam fir (*Abies balsamea*) and larch.

C. BETTER KNOWN IMPORTANT PESTS OF PINE (PINUS).**Eriophyes pini** Nalepa.

(Pine Gall Mite. Eriophyidæ; Acarina.)

Hosts: *Pinus silvestris*, *P. montana*, *P. mughus*.

Injury: Causes galls in the twigs resulting in deformed growth.

Description and biology: A tiny elongate four-legged mite which breeds in the young twigs of pines.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 116, 117, figs. 90-92.

Gelechia dodecella Linnæus.

(Pine Bud Moth. Gelechiidæ; Lepidoptera.)

Hosts: Pines (*Pinus* spp.).

Injury: Breeds in buds, needles, and young shoots, and is as injurious as *Evetria buoliana*, the pine-shoot moth.

Description and biology: Adult moth with wing spread 10–12 mm., forewings dark gray or gray brown, with two obscure light gray transverse fasciæ, and six pairs of black flecks. Larva reddish brown with black head and thoracic shield. The larva bores in buds, needles, and young shoots.

Distribution: Germany.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, p. 430, fig. 365.

Cnethocampa pinivora Treitschke; **Cnethocampa pityocampa** Schiffermiller.

(Pine Procession Moths. Cnethocampidæ; Lepidoptera.)

Hosts: Pines.

Injury: Defoliate; sometimes serious.

Description and biology: Moth of *pinivora* with forewings yellowish gray, hind wings with a sharply toothed crossline. Moth of *pityocampa* with forewings whitish gray; hind wings with a scarcely toothed crossline. Larva of *pinivora* greenish gray, with velvety black dorsal stripe and black head, and with reddish yellow warts on the fourth to eleventh segments. Larva of *pityocampa* similar but slate blue to black. The larvæ feed on the foliage and live gregariously, wandering in the daytime in processions of a single or double row. Pupate in cocoons in the ground. The larvæ of *pityocampa* hibernate in nests in the crowns.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 386.

HESS, RICHARD. Der Forstschutz, 1900, vol. 2, pp. 452–455.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

Dendrolimus pini Linnæus.

(Pine Spinner. Lasiocampidæ; Lepidoptera.)

Hosts: Pine.

Injury: Very serious defoliator.

Description and biology: Moth variable in color, from brown red to slate gray, unicolorous or mottled; middle of forewings with white crescent. Larva 8 cm. long, with steel-blue stripes on meso- and metathorax, general color varying from reddish to slaty gray; pubescence very long and clustered. The larva feeds on the foliage and spins a neat oval silken cocoon.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 376.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 331–342, figs. 284, 285.

Panolis griseovariegata Goeze.

(Pine Noctuid. Noctuidæ; Lepidoptera.)

Hosts: Pine.

Injury: Attacks foliage, buds, and tender shoots.

Description and biology: Moth with forewings variegated cinnamon red and yellowish gray with white marks; hind wings brownish black. Larva green, with three broad white dorsal stripes, a yellowish orange lateral stripe, head shining yellowish, 35 mm. long. Eggs greenish, laid in a row on the underside of needles.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 357.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 378–380, figs. 308, 309.

* *Evetria buoliana* Schiffermiller.

(European Pine-Shoot Moth. Tortricidæ; Lepidoptera.)

*Hosts: Pinus silvestris, P. laricio, P. montana, P. strobus, P. resinosa.**Injury:* Causes deformation of tree. Has been introduced into the United States in nursery shipments.*Description and biology:* Adult moth 12 mm. long, small, gayly colored; the head and its appendages and thorax light orange yellow, abdomen dark gray; forewings bright ferruginous orange, suffused with dark red, especially toward the tips, and with several irregular forked anastomizing, silvery crosslines and costal strigulæ; hind wings dark blackish brown; legs whitish, the anterior ones reddish in front. *Pupa* stout, robust, chestnut brown; abdominal segments with rings of short dark spines. *Larva* 16 mm. long, brown with black head and thoracic shield; feeds in the young buds and sheets. *Egg* small, flat, white, laid at base of bud. (See plates XII, XIII.)*Distribution:* Europe, introduced into United States in 32 nurseries.

Busck, A. U. S. Dept. Agric., Bul. 170, Feb., 1915.

* *Evetria* spp.

(Pine Bud and Gall Moths. Tortricidæ; Lepidoptera.)

Species: In addition to * *E. buoliana* Schiffermiller which is separately treated, the following species injure pines. *E. resinella* Linnæus; Europe; makes large galls in twigs of pines. * *E. turionana* Hübner; Europe, North America; attacks buds of pines, especially the terminal bud. * *E. pinivorana* Zeller; Europe, North America; attacks the axillary buds. * *E. duplana* Hübner, Europe, Japan, North America; attacks young shoots. * *E. frustrana* Comstock, the Nantucket pine moth, * *E. rigidana* Fernald, and * *E. comstockiana* Fernald are among our most serious pests in this country.*Distribution:* The distribution cited above shows clearly that these species are readily distributed in nursery stock.SORAUER, B. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 290-292.
NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 415-419, figs. 347-351.*Thecodiplosis brachyntera* Schwäger.

(Pine Needle Midge. Itonididæ [Cecidomyidæ]; Diptera.)

*Hosts: Pinus silvestris, P. laricio, P. montana.**Injury:* Breeds in the needles, forming a small gall-like swelling.*Description and injury:* Fly very small. Larva yellowish. Egg laid between the bases of two needles.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 444.

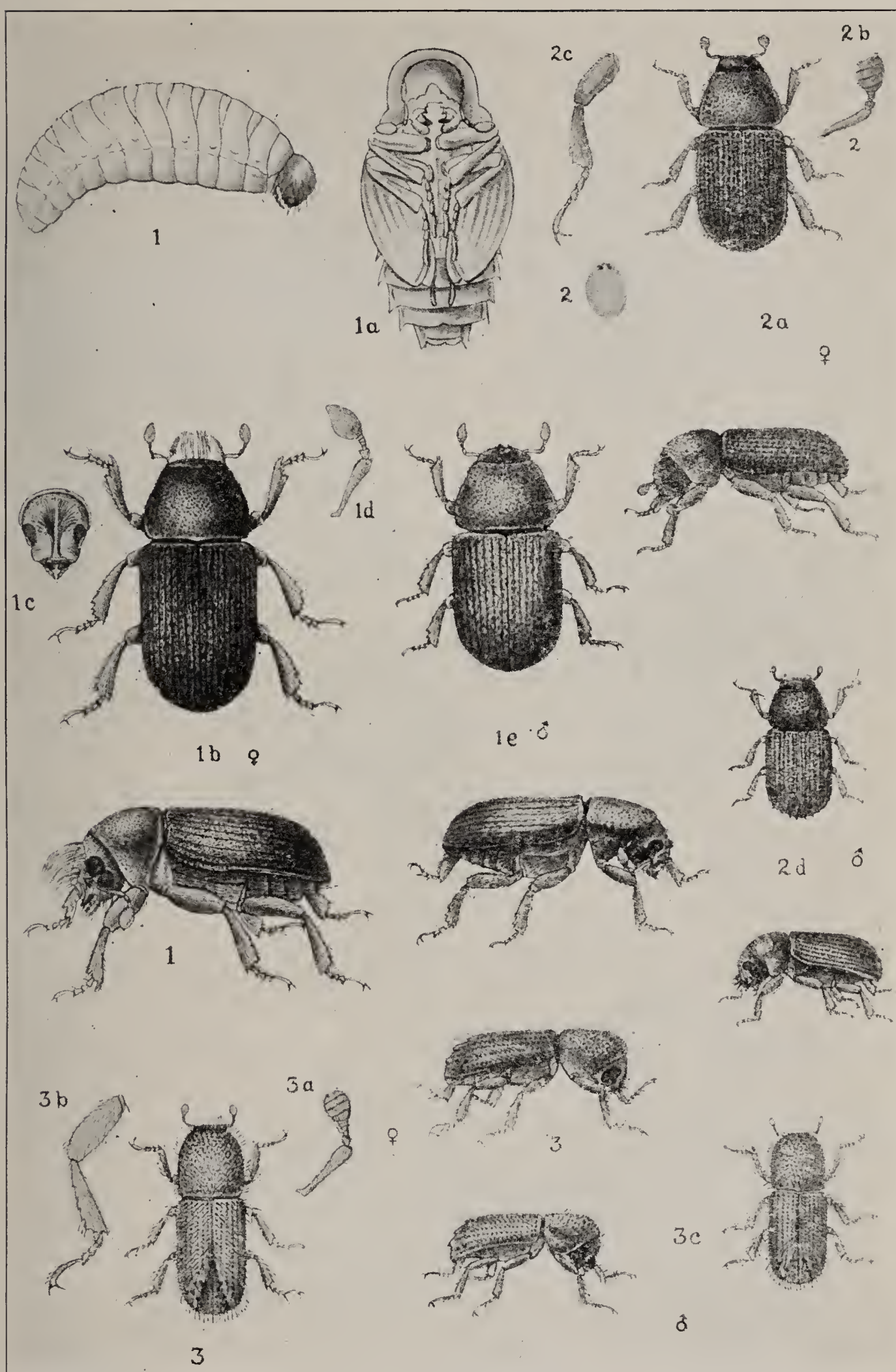
D. OTHER INSECTS ATTACKING PINE (PINUS).

HEMIPTERA.

Aphididæ:*Lachnus pini* Linnæus *L. tomentosus* DeGeer, *L. tæniatus* Koch, *L. nudus* DeGeer, and *L. agilis* Kaltenbach, plant lice; Europe; attack needles, tender growth and twigs.**Coccidæ:**

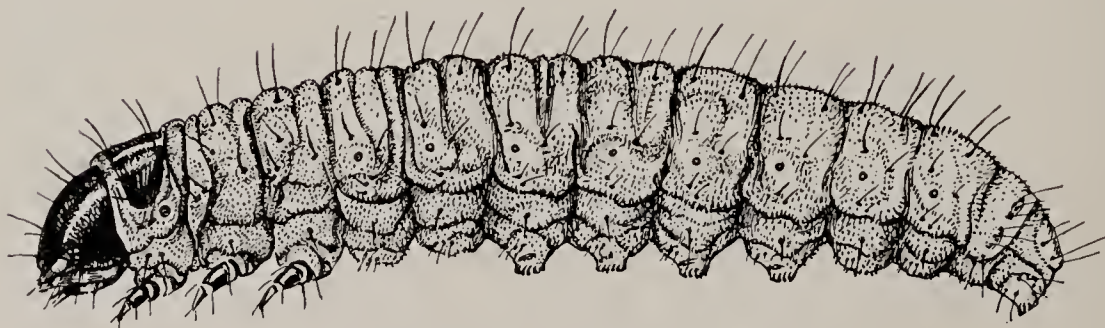
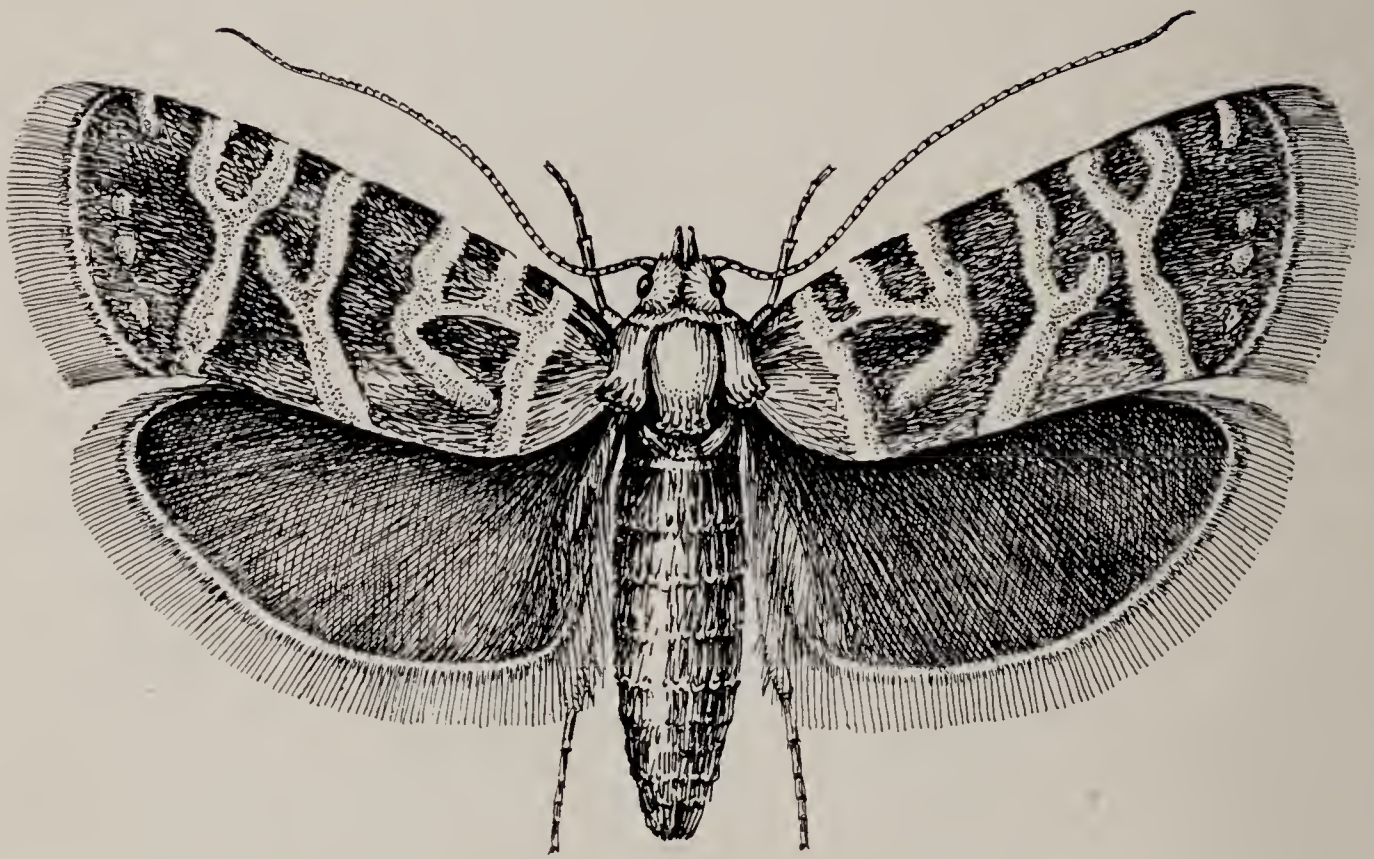
Armored—

Aspidiotus (Aonidia) lauri Bouché; Italy; *Pinus*.*Aspidiotus (Aonidia) pinicola* Leonardi; Cyprus, Spain; *Pinus halepensis, P. silvestris*.*Chionaspis austriaca* Lindinger; Australia; *Pinus laricio nigricans*.



CONIFEROUS BARK BEETLES.

FIG. 1.—*Polygraphus trenchi*: Larva; 1a, pupa; 1b, adult female, dorsal view (above) and lateral view (below); 1c, head of female; 1d, antenna; 1e, adult male, dorsal view (above) and lateral view (below). FIG. 2.—*Phloeosinus zhobi*: Egg; 2a, adult female, dorsal view (above) and lateral view (below); 2b, antenna; 2c, leg; 2d, adult male, dorsal view (above) and lateral view (below). FIG. 3.—*Pityogenes coniferae*: Adult female, dorsal view (left) and lateral view (right, above figure); 3a, antenna; 3b, leg; 3c, adult male, lateral view (left) and dorsal view (right). (Stebbing.)



EUROPEAN PINE SHOOT MOTH, EVETRIA BUOLIANA, MOTH, LARVA. (BUSCK.)



1



2



3

WORK OF EVETRIA BUOLIANA ON PINE SHOOTS. (BUSCK.)



PINE BORERS.

FIG. 1.—*Capnodis indica*: Larva; 1a, adults. FIG. 2.—*Anthaxia osmastoni*: Larva; 2a, adults. FIG. 1b.—Stem of *Pinus longifolia* showing work of both beetles. (Stebbing.)



THE PINE BARK BEETLE.

The pine bark beetle (*Platypus biformis*): Males and females and injury to *Pinus longifolia*. (Stebbing.)

Coccidææ—Continued.**Armored—Continued.**

- Diaspis visci* Schrank; Germany, Italy; *Pinus filifolia*, *P. silvestris*.
 **Lepidosaphes newsteadi* Sule; Europe; *Pinus austriaca*, *P. pumilio*, *P. silvestris*.
Leucaspis læwi Colvée; Europe; *Pinus* spp.
Leucaspis pini Hartig; Europe; *Pinus austriaca*.
Leucaspis pusilla Læw; Europe; *Pinus cembra*, *P. silvestris*.
Leucaspis signoreti Targioni-Tozzetti; Italy, Corsica, Cyprus; *Pinus halepensis*, *P. laricio*; *P. silvestris*.
Poliaspis pini Maskell; Japan; *Pinus densiflora*, *P. austriaca*, *P. thunbergii*.

Unarmored—

- Gueriniella serratulæ* Fabricius; Algeria; southern France; *Pinus*.
Palæococcus fuscipennis Burmeister; Germany, France; *Pinus silvestris*.
Pseudococcus pini Kuwana; Japan; *Pinus*.
Puto antennata Signoret; France, Switzerland; *Pinus cembra*, *P. silvestris*.

Aradidæ;

- Aradus cinnamomeus* Panzer; Europe; occurs under bark scales; causes needles to become yellow and remain small.

COLEOPTERA.**Anobiidæ;**

- Ernobius abietinus* Gyllenhal; Europe; attacks cones.
Ernobius nigrinus Sturm, and *E. pini* Sturm; Europe; attacks pith of young shoots.
Xestobium plumbeum Illiger; Europe; breeds in the dead wood.

Meloidæ;

- Cantharis fusca* Linnæus; a blister beetle; Europe; attacks shoots.

Buprestidæ.

- Agrilus betuleti* Ratzeburg; and **A. viridis* Linnæus; Germany; bore stems of young trees and branches of older trees.
Chrysobothris solieri Laporte et Gory; Europe; bores in bast and sapwood of seedlings of *P. silvestris* and *P. pinaster*.
Capnodis indica Thomson; India; bores in bast and sapwood of *Pinus longifolia*. (See pl. XIV, figs. 1a, 1b.)
Buprestis geometrica Laporte et Gory; India; bores in *Pinus longifolia*.
Anthaxia osmastoni Stebbing; India; bores in the bark and bast of *Pinus longifolia*. (See pl. XIV, fig. 2.)
Phænops cyanea Fabricius; Europe; bores in bark.

Tenebrionidæ.

- Melinimon tibiale* Fabricius, *Gonocephalum (Opatrum) sabulosum* Linnæus, and *Phylan gibbus* Fabricius attack tender roots, bark, and tops of seedlings and nursery stock.
Setenis indosinica Fairmaire; India; bores in wood of *Pinus excelsa*.
Blaps armata Blair; India; bores in the trunks of *Pinus gerardiana*.

Scarabæidæ.

- Amphimallon solstitialis* Linnæus; England; injures the roots of *Pinus silvestris*.
Melolontha hippocastani Fabricius; *M. melolontha* Linnæus; Europe; injure roots of seedling and needles.
Polyphylla fullo Linnæus; Europe; attacks the roots of seedlings, and the adults feed on the needles.

Cerambycidæ.

- Acanthocinus ædilis* Linnæus; Germany; bores in the sapwood of felled or prepared lumber.
Monohammus galloprovincialis Olivier; Germany; attacks *Pinus silvestris* and *P. pinaster*.
Nothorhina muricata Dalman, India; bores in trunks of *Pinus longifolia*.
Criocephalus tibetanus (?) Sharp; India; bores in bast and sapwood of *Pinus gerardiana*.

Chrysomelidæ.

- Cryptocephalus pini* Linnæus; Germany; attacks the foliage and bark of young shoots.
Luperus pinicola Duftschmidt; Germany; attack the foliage and bark of young shoots.

Brentidæ.

- Eubactrus* sp.; India; bores in trunks of *Pinus longifolia*.

Rhinomaceridæ.

- Rhinomacer attelaboides* Fabricius; a weevil; Germany; breeds in the catkins.

Brachyrhinidæ.

- Polydrusus chærodrysius* Gredler, *P. intermedius* Zetterstedt, *P. undatus* Fabricius, *P. villosulus* Chevrolat; Europe; attack the buds and needles of conifers; the larvæ breed at the roots of trees.

Curculionidæ.

Brachonyx pincti Paykull; weevil; Europe; mines the needles of *Pinus silvestris*.



FIG. 38.—Pine weevil (*Cryptorhynchus brandisi*): Injury to *Pinus longifolia*. (Stebbing.)

Cryptorhynchus brandisi Stebbing, the chir pine weevil; India; breeds in wood of *Pinus longifolia* and *P. khasya*. (See text fig. 38.)

Cryptorhynchus raja Stebbing; India; breeds in bark and sapwood of *Pinus excelsa*.

Cossonidæ.

Mesites aquitanus Fairmaire; Europe; bores in pine wood standing in sea water.

Ipidæ.

Carphoborus minimus Fabricius; Germany; makes galleries in branches and tops of *Pinus austriaca*, *P. montana*, and *P. silvestris*.

Cryphalus longifolia Stebbing; India; *Pinus longifolia*.

Cryphalus major Stebbing; India; *Pinus longifolia*.

Crypturgus cinereus Herbst; Germany.

Hylastes angustatus Herbst, *H. ater*, and *H. opacus* Erichson, attack taproots.

Hylastes longifolia Stebbing; India; *Pinus longifolia*.

Hylurgus lijniperda Fabricius; Germany; attacks taproots.

Ips blandfordi Stebbing; India; *Pinus gerardiana*.

Ips acuminatus Gyllenhal; Lapland to Sicily; bark and sapwood.

Ips longifolia Stebbing; India, *Pinus longifolia* and *P. gerardiana*.

Ips mannsfeldi Wachtl.; Europe; *Pinus austriaca*.

Orthotomicus erosus Wollaston and *O. longicollis* Gyllenhal; Europe.

Phæosinus zhobi Stebbing; India; *Pinus gerardiana*. (See pl. XI, figs. 2a-2d.)

Pityogenes trepanatus Nordl.; Europe; *Pinus austriaca*.

Pityogenes lipperti Henschel; Dalmatia; Aleppo pine.

Pityophthorus sampsoni Stebbing; India; *Pinus excelsa*.

Ipidæ—Continued.

Pityophthorus glabratus Eichhoff; Europe; *Pinus silvestris*.

Pityophthorus lichtensteini Ratzeburg; Europe; *Pinus silvestris*, *P. strobus*, *P. pinaster*.

Polygraphus grandiclava Thomson; Europe; *Pinus strobus*.

Polygraphus trenchi Stebbing; India; *Pinus gerardiana*. (See text fig. 39, and pl. XI, figs. 1a-1e.)

Polygraphus nigra Stebbing; India; *Pinus excelsa*.

Polygraphus himalayensis Stebbing; India; *Pinus longifolia*.

Polygraphus longifolia Stebbing; India; *Pinus longifolia*.

Xyleborus eurygraphus Ratzeburg; Europe.

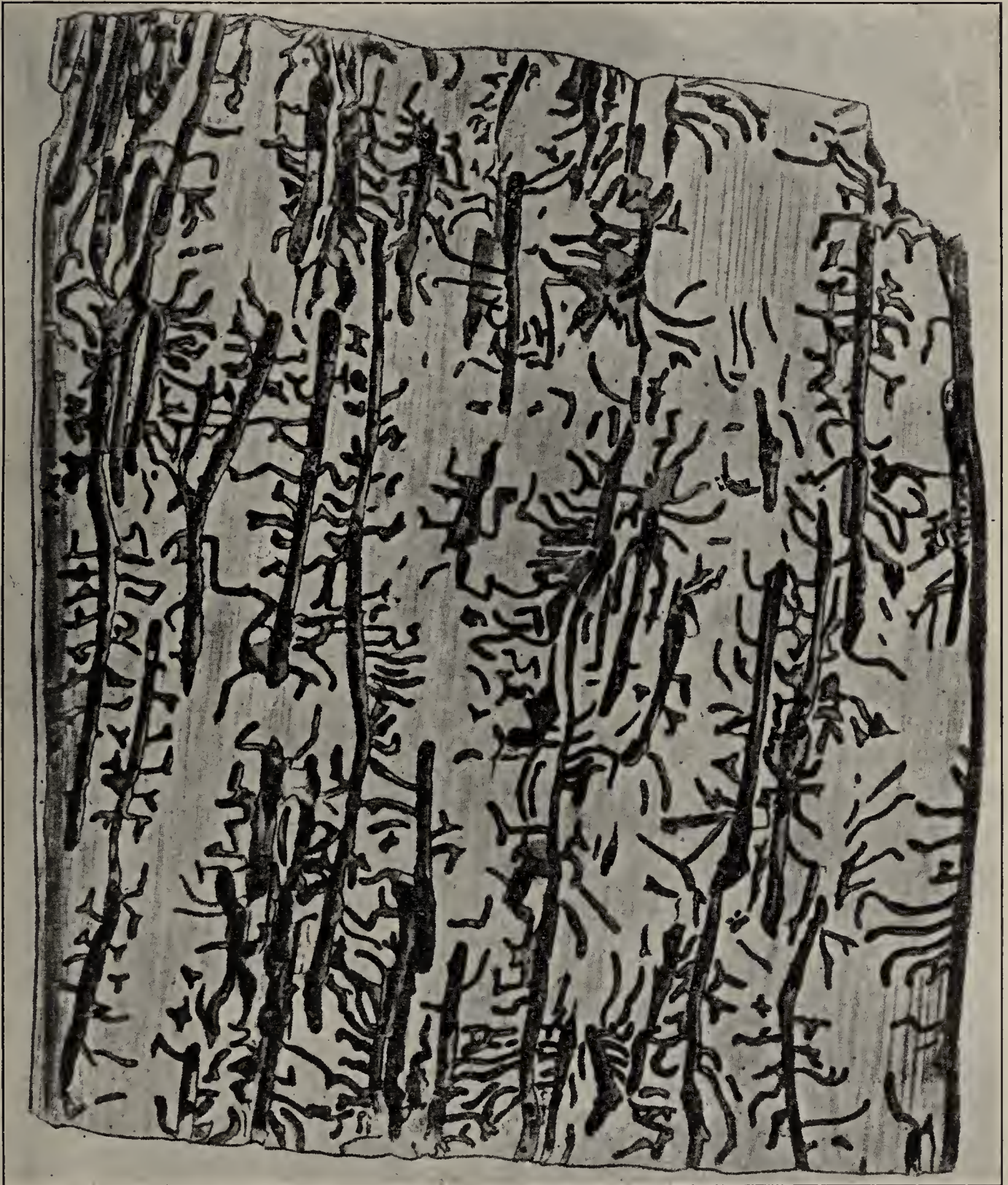


FIG. 39.—Pine bark beetle (*Polygraphus trenchi*): Galleries in *Pinus gerardiana*. (Stebbing.)

Platypodidæ.

Crossotarsus fairmairei Chapuis; India; bores in wood of *Pinus excelsa*.

Platypus biformis Chapuis; India; infests *Pinus longifolia*. (See pl. XV.)

LEPIDOPTERA.**Geometridæ.**

Semiothisa liturata Cln.; Europe; attacks the needles.

Lasiocampidæ.

Lasiocampa quercus Linnæus; Germany; attacks needles.

Noctuidæ.

Agrotis tritici Linnæus; Europe; injures roots of seedlings.

Pyralidæ.

Dioryctria splendidella H. Sch.; Germany; attacks cones, shoots, and sapwood.

Ephestia elutella Hübner; Germany; attacks seeds and cones.

Psychidæ.

Clania crameri Westwood; India; attacks needles of *Pinus longifolia*.



FIG. 10.—Pine web-worm (*Cnethocampa pityocampa*): Nests. (Barbey.)

Hyponomeutidæ.

Ocnerostoma piniariella Zell.; Germany; attacks needles.

Cnethocampidæ.

Cnethocampa pinivora Treitschke; Europe; attacks foliage.

Cnethocampa pityocampa Schiffmiller; Europe; attacks foliage of *Pinus pinea*, *P. pinaster*, *P. laricio*, *P. halepensis*. (See text fig. 40.)

HYMENOPTERA.

Megalodontidæ.

Itycorsia cimpestris Linnæus, a sawfly; Europe; attacks needles. (See text fig. 41.)

E. BETTER KNOWN IMPORTANT PESTS OF FIR (ABIES).

Eucosoma nigricana H. Sch. (Epiblema).

(Fir Bud Worm. Tortricidæ; Lepidoptera.)

Host: Silver fir (*Abies pectinata* D. C.)

Injury: Feeds in the buds. Very likely to be introduced in buds on nursery stock during winter.

Description and biology: Moth wing expanse 11–13 mm., forewings dark brown with violet red shimmer and lead gray lines. Larva yellowish to reddish brown, with black head and thoracic shield. Feeds in the buds, hibernating as a larva. In the spring it goes from bud to bud, often under a silken web. Pupates in the ground.

Distribution: Europe (Germany).

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., pp. 408–409, fig. 340.

SORAUER, P. Handbuch der Pflanzenkrankheiten 3d ed., 1913, vol. 3, p. 285.

Enarmonia rufimitrana H.-Schf. (Steganoptycha).

(Redheaded Fir Worm. Tortricidæ; Lepidoptera.)

Hosts: Silver fir (*Abies pectinata* D. C.).

Injury: Feeds on the needles and young shoots.

Description and biology: Moth, wing expanse 12–16 mm., head and thorax rust yellow, forewings yellowish gray with many lead-colored lines. Larva dirty yellow green, with rust-red head. (See text fig. 42.)

Distribution: Europe.

HESS, RICHARD. Der Forstschutz, 1898, vol. 1, p. 490, 491.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, p. 408, figs. 338,



FIG. 41.—Pine sawfly (*Itycorsia cimpensis*): Injury. (Barbey.)

Plemelliella abietina Seitner.

(Spruce Seed Midge. Itonididæ [Cecidomyiidæ]; Diptera.)

Host: Fir (*Abies*).*Injury*: Breeds in the seed, which become shrunken and worthless.*Description*: Larvæ red.*Distribution*: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 444.

FIG. 42.—Red-headed firworm (*Enarmonia rufimitrana*): Injury. (Barbey.)**F. OTHER INSECTS ATTACKING FIR (ABIES).****HEMIPTERA.****Aphididæ.***Lachnus grossus* Kaltenbach and *L. piceæ* Walker, plant lice; Europe (Germany); live on the bark.*Lachnus pichtæ* Mordwilko; Europe; lives on the under side of the needles.*Prociphilus bumeliæ* Schrank, a root louse; Europe; attacks roots of *Abies pectinata*, *A. balsamea*, and *A. fraseri*. (See Ash.)

Coccidæ:

Armored—

Lepidosaphes abietis Signoret; Europe; *Abies*.*Poliaspis pini* Maskell; Japan; *Abies firma*.

Unarmored—

Lecanium sericeum Lindinger; Bavaria; *Abies pectinata*.

COLEOPTERA.

Anobiidæ.*Dryophilus pusillus* Gyllenhal; Europe; attacks buds.*Ernobius abietis* Fabricius, *E. angusticollis* Ratzeburg, and *E. longicornis* Sturm; Europe; attacks the cones.**Lymexylonidæ.***Hylecætus dermestoides* Linnæus; Germany; bores in white fir wood.**Elateridæ.***Athous hirtus* Herbst; Europe; attacks seedlings of fir.**Cerambycidæ.***Molorchus minor* Linnæus; Germany; attacks the sapwood of felled trees and lumber.*Tetropium fuscum* Fabricius; Germany; bores in trunks of old and dead trees.**Ipidæ.***Cryphalus strohmeieri* Stebbing; India; *Abies webbiana*.*Pityokteines spinidens* Reitter, and *P. vorontzowi* Jacobson; Europe.*Xyloterus intermedius* Sampson; India; *Abies webbiana*.**Scolytoplatypodidæ.***Scolytoplatypus himalayensis* Stebbing; India; *Abies webbiana*.

LEPIDOPTERA.

Tortricidæ.*Tortrix murinana* Hübner; Europe; attacks needles and young shoots of *Abies pectinata*.*Laspeyresia proximana* H. Sch.; Europe; mines the needles.*Laspeyresia coniferana* Ratzeburg; Germany; bores in the bark of *Abies pectinata*.*Olethreutes hercyniana* Treitschke; Europe; attacks needles of *Abies pectinata*.

HYMENOPTERA.

Callimonidæ.*Megastigmus borriesi* Crosby; a chalcid; Japan; breeds in seed of *Abies mariesii*.**G. BETTER KNOWN IMPORTANT PESTS OF SPRUCE (PICEA).*****Laspeyresia pactolana* Zetterstedt (*Grapholitha*)**

(Spruce Bark Tortricid. Tortricidæ; Lepidoptera.)

Host: Spruce (*Picea excelsa*).*Injury*: Breeds in twigs, causing a swelling and deformation, or the death of the outer parts.*Description and biology*: *Moth*, wing expanse 12–16 mm., forewing fringed, olive brown with double white angled fascia at the middle and several white marks beyond this; hind wings gray-brown, fringed. *Larva*, 10–12 mm. long, five pairs of abdominal legs, whitish to reddish in color, head and thoracic shield yellowish brown. (See text fig. 43.)*Distribution*: Germany.

HESS, RICHARD. Der Forstschutz, 1898, vol. 1, pp. 483, 485, fig. 172.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 409–411, figs. 341, 342.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 281.

***Laspeyresia strobilella* Linnaeus (Grapholitha).**

(Spruce Cone Moth. Tortricidæ, Lepidoptera.)

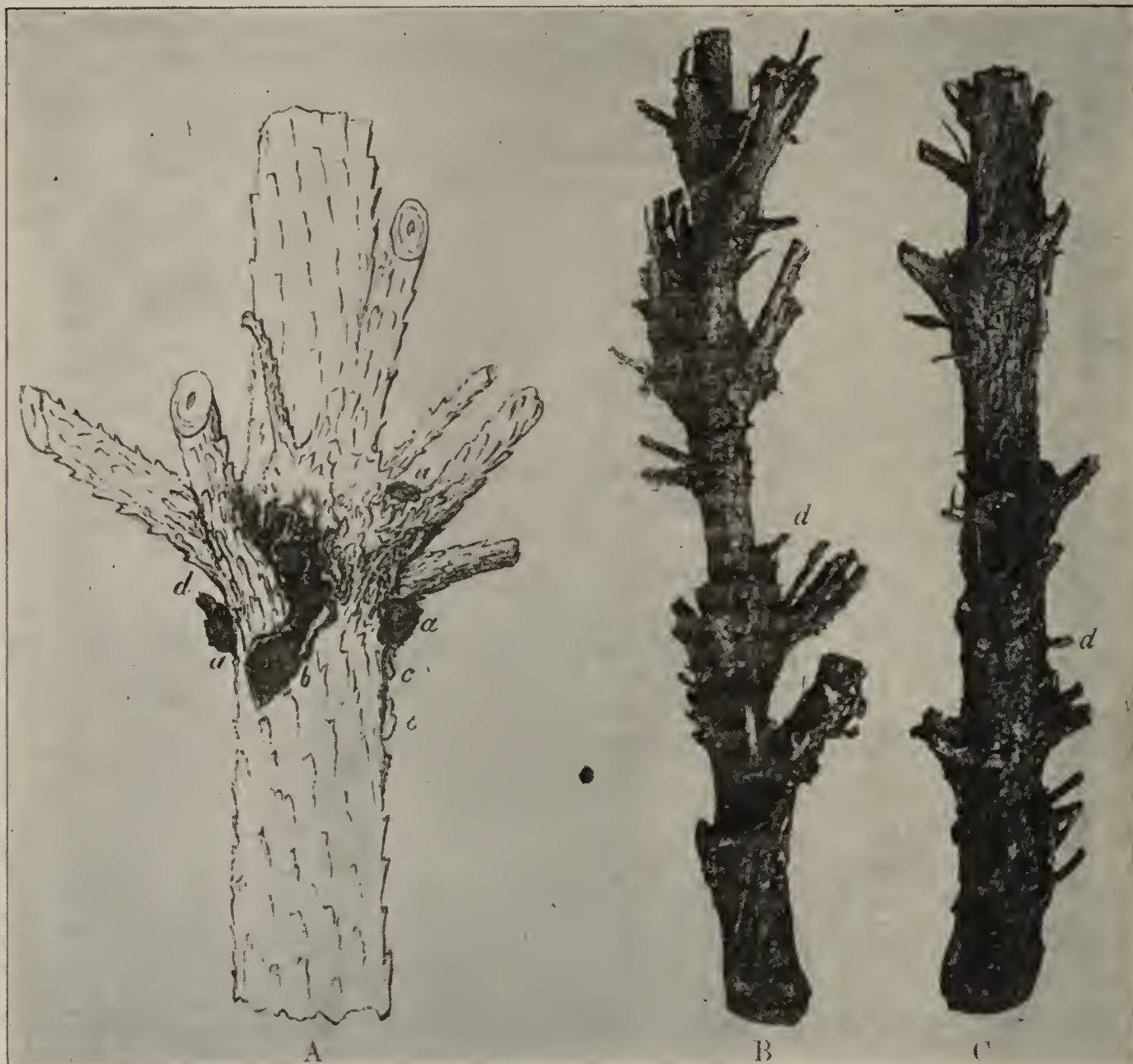
Host.—Spruce (*Picea excelsa*).*Injury*.—Breeds in the cones.

Description and biology.—*Moth*, wing expanse 10–14 mm., forewings dark gray brown, fringed, with fine whitish lines, hind wings gray brown, with white fringe. *Pupates* in the cones. *Larva* 11 mm. long, yellowish white with light brown head and thoracic shield. The larva breeds in the cones. *Eggs* laid on the young green cones.

Distribution: Germany.

HESS, RICHARD. Der Forstschutz, 1898, vol. 1, pp. 486, 487.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 281.

FIG. 43.—Spruce bark tortricid (*Laspeyresia pactolana*): Injury. (Nüsslin.)***Laspeyresia tedella* Clerck (Epiblema).**

(Spruce Nest-Worm. Tortricidæ; Lepidoptera.)

Host: Spruce (*Picea excelsa*, *Picea sitchensis*).*Injury*: Injures the needles.

Description and biology: *Moth*, wing expanse, 12 mm.; forewings golden brown, with brown silvery transverse fascia and finer markings. *Larva* light yellowish brown or greenish with two dorsal lines. Head and thoracic shield brownish black, flecked;

9 mm. long. The larvæ spin nests among the needles. *Pupate* in the ground, where the larvæ hibernate.

Distribution: Europe (Germany).

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 285.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., pp. 412, 413, figs. 344, 345.

Dasyneura abietiperda Henschel; ***Dasyneura piceæ*** Hartig.

(Spruce Gall Midges. Itonididæ [Cecidomyiidæ]; Diptera.)

Host: Spruce.

Injury: Attack twigs at the base of needle clusters, injuring dormant buds and sometimes killing entire twig.

Description: Europe (Germany).

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 454, 455.

Reseliella piceæ Seitner.

(Spruce Seed Midge. Itonididæ [Cecidomyidæ]; Diptera.)

Host: Spruce.

Injury: Breeds in the seed.

Description and injury: *Fly*, yellowish red with dark bands, 2–4 mm. long. *Larva*, 4 mm. long, rose-red. *Eggs* laid in young green cones.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten ed. 3, vol. 3, 1913, pp. 448, 449.

H. OTHER INSECTS ATTACKING SPRUCE (PICEA).

HEMIPTERA.

Aphididæ.

Lachnus grossus Kaltenbach, *L. fasciatus* Kaltenbach, *L. piceæ* Walker, and *L. pinicola* Kaltenbach plant lice; Europe; attack stems, twigs, and tender growth.

Coccidæ:

Unarmored—

Phenacoccus piceæ Löw; Europe; *Picea excelsa*.

Physokermes piceæ Schrank; Europe; *Picea alba*, *P. excelsa*, *P. pungens*, *P. sitchensis*.

Armored—

Syngenaspis parlatoreæ Sule.; Bohemia, Bosnia; *Picea excelsa*, *P. omorica*.

COLEOPTERA.

Carabidæ.

Calathus fuscipes Goeze, *Ophonus pubescens* Müller, *Harpalus æneus* Fabricius, and *Pterostichus lepidus* Leske, ground beetles, are destructive to the seed in Europe.

Elateridæ.

Lacon sp. near *davidi* Fairmaire; India; breeds in trunks of *Picea morinda*.

Cerambycidæ.

Teledapus dorcadioides Pascoe; a wingless longicorn; India; breeds in trunks of *Picea morinda*.

Leptura rubriola Bates; India; breeds in the trunks of *Picea morinda*.

Ipidæ.

Cryphalus morinda Stebbing; India; attacks *Picea morinda*.

Hylastes cunicularius Erichson; Germany; attacks bark and roots.

Hylurgops glabratus Zetterstedt; Germany, Siberia.

Phlæophthorus rhododactylus Mannerheim; Europe; *Picea excelsa*.

Phlæophthorus spinulosus Rey; Europe; attacks branches.

Pityophthorus exculptus Ratzeburg; Europe.

Dryocætes indicus Stebbing; India; attacks *Picea morinda*.

Platypodidæ.

Crossotarsus coniferæ Stebbing; India; bores in wood of *Picea morinda*.

LEPIDOPTERA.

Tortricidæ.

Tortrix histrionana Froelichs; Germany; attacks shoots.

Hyponomeutidæ.

Argyresthia illuminatella Zell.; Germany; attacks buds and young shoots.

HYMENOPTERA.

Tenthredinidæ.

Lygæonematus pini Ratzeburg; the small spruce sawfly; Europe; defoliates and injures buds and young shoots.

Lygæonematus ambiguus Fallen and *L. sareseni* Hartig; Europe; defoliators.

Siricidæ.

Sirex imperialis Kirby, the spruce wood wasp; India; bores in wood of *Picea morinda* Lind.

Sirex spectrum Linnaeus; Europe. (See text fig. 44.)

I. BETTER KNOWN IMPORTANT PESTS OF LARCH (LARIX).

Eriophyes laricis von Tubeuf.

(Larch Blister Mite. Eriophyidæ; Acarina.)

Host: Larch [*Larix decidua* (*europæa*)].

Injury: Forms gall-like deformations of the terminal bud.



FIG. 44.—Spruce wood wasp (*Sirex spectrum*): Adult attacking *Picea*. (Barbey).

Description and biology: A four-legged blister mite which forms gall-like swellings of the terminal or axillary buds. Very easy to introduce on nursery stock.

Distribution: Europe.

VON TUBEUF. Forst. naturw. Zeitschr., 1897, Bd. 6, pp. 120–124, 3 figs.

Coleophora laricella Hübner.

(Larch Needle Miner. Elachistidæ; Lepidoptera.)

Host: Larch [*Larix decidua* (*europæa*)].

Injury: Attacks early buds and mines the needles. The injury is great. Easily introduced in nursery stock.

Description and biology: Adult moth 3 mm. long, with wing expanse 9 mm., forewing brownish gray, faintly shining, wings fringed with long hairs. Larva dark reddish brown, the little head, thoracic shield, and anal portion dark, 5 mm. long. The larva mines needles and buds. Pupates in a sack or case.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 253.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., pp. 431–433, figs. 366, 367.

Argyresthia lævigatella H. S.

(Larch Shoot Moth. Hyponomeutidæ; Lepidoptera.)

Host: Larch (*Larix europæa*).*Injury*: Very injurious to young shoots.*Description and biology*: Larva 6-7 mm. long, bright yellow, with black head, feeds under the bark of young larch shoots. After hibernating the larva is somewhat reddish with dark lines. Eggs laid singly at bases of needles.*Distribution*: Europe.SORAUER, P. Hand-
buch der Pflanzen-
krankheiten, 3d ed.,
1913, vol. 3, p. 269.**Dendrolimus sibiricus**
Tschetwerikoff.(Larch Spinner. Lasi-
ocampidæ; Lepidop-
tera.)*Host*: Larch.*Injury*: Considera-
ble.*Description*: Similar
to *D. pini* L.*Distribution*: Ural.TSCHETWERIKOFF.
Rev. Russ. Ent., vol.
8, 1908, pp. 1-7, 3
figs.**Laspeyresia zebeana** Rat-
zeburg (*Grapholitha*).(Larch Gall Moth. Tor-
triciidæ; Lepidop-
tera.)*Host*: Larch (*Larix*
europæa).*Injury*: Forms galls
on twigs, giving ad-
mission to disease or
causing deformity.
Liable to introduction
in nursery stock during
the winter.*Description and biology*: Moth, wing expanse 17 mm., forewings grayish black with whitish transverse lines on the costal margin. Larva dirty yellow green with brown thoracic shield, 10 mm. long. The larva attacks the twigs at the axils of branches forming a gall-like swelling. (See text fig. 45.)*Distribution*: Germany.FIG. 45.—Larch gall moth (*Laspeyresia zebeana*): Injury. (Barbey.)

- SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 282.
 NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., pp. 422-424, figs. 356, 357.

***Dasyneura loricis* F. Lw.**

(Larch Bud Gall Midge. Itonididæ [Cecidomyidæ]; Diptera.)

Host: Larch.

Injury: Attacks buds, forming galls.

Description and biology: Eggs laid at base of needle clusters. The larvæ enter the dormant buds forming a gall-like swelling, and overwinter as very small larvæ. They develop in the buds through the year. Pupate in cocoon in autumn. The attacked buds die.

Distribution: Europe.

- SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 454, 455.

J. OTHER INSECTS ATTACKING LARCH (LARIX).

HEMIPTERA.

Aphididæ.

Lachnus loricis Koch, a plant louse; Europe; attacks needles and young shoots.

COLEOPTERA.

Anobiidæ.

Dryophilus pusillus Gyllenhal; Europe; attacks buds.

Ipidæ.

Cryphalus intermedius Ferrari; Germany.

LEPIDOPTERA.

Hyponomeutidæ.

Argyresthia lævigatella H. Sch.; Germany; attacks young shoots.

L. BIBLIOGRAPHY OF PRINCIPAL WORKS CONSULTED.

- BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887.
 FERNALD, M. E. Catalogue Coccidæ of the World, Mass. Exp. Sta., bull. 88, 1903.
 GILLANDERS, A. T. Forest Entomology, 1908.
 HESS, R. Der Forstschutz, vols. 1, 2, 1898.
 LINDINGER, L. Die Schildläuse (Coccidæ), 1912.
 NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed., 1913.
 SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., vol. 3, 1913.
 STEBBING, E. P. A Manual of Elementary Forest Zoology for India, 1908.
 STEBBING, E. P. Indian Forest Insects. Coleoptera., 1914.
 TRÄGARDH, IVAR. Sveriges skogsinsekter, 1914.

CORN; MAIZE.

(*Zea mays* Linnæus. Family Gramineæ.)

Although the greater part of our commerce in corn is in the nature of exports, there are always likely to be imports of seed corn from various parts of the world. Corn is probably American in origin, and consequently there are few foreign pests not already widely distributed in the country.

A. CORN INSECTS LIKELY TO BE IMPORTED.

* *Aræcerus fasciculatus* De Geer.

(Coffee-bean Weevil. Family Anthribidæ; Coleoptera.)

Hosts: This weevil is polyphagous, feeding in dry food products and drugs, china-berries (*Melia azedarach*), dead cotton bolls, cornstalks, etc.

Injury: Very injurious to food products and also to live corn.

Description: A mottled grayish weevil with short, blunt snout. Larva hairy.

Distribution: Cosmopolitan.

TUCKER, E. S. U. S. Dept. Agr., Bur. Entomology, Bul. 64, pt. 7, 1909, pp. 60-64, pl. 3, fig. 18.

CHITTENDEN, F. H. U. S. Dept. Agr., Bur. Entomology, Bul. 8, n. s., 1897.

***Dichocrocis punctiferalis* Guénée.**

(Pyralidæ; Lepidoptera.)

Hosts: Maize, peach, pawpaw, apple, orange, loquat, guava, cassia, custard apple, granadilla, banana, millet, *Canavalia indica*, senna bean, *Dahlia*, castor bean, cacao, sunflower.

Injury: Although primarily a maize pest, it is becoming quite a serious enemy of fruit trees in Cleveland District, Queensland. Breeds in pods of castor bean and cacao, and heads of sunflower in India.

Description and biology: Adult measures about 24 mm. in wing expanse; color pale orange yellow, marked with numerous black dots on wings and body. Egg presumably deposited on leaf stalk near or at point of junction with main stem or young fruit; larva on hatching penetrates into the hollow stalk or fruit, and after feeding for a time bores into the crown, in which it remains until ready to pupate. On leaving the crown of the fruit it crawls to some convenient crevice and constructs a loose silken web under which it transforms to a reddish brown pupa.

Distribution: Australia, Japan, China, India, Burma, Ceylon. P. J.

JARVIS, E. Queensland Agricultural Journal, 1913, p. 33, July.

MAXWELL-LEFROY, H. Mem. Dept. Agric. India, vol. 1, 1907, p. 211.

***Siphonella pumilionis* Bjerk.**

(Corn Fly. Oscinidæ; Diptera.)

Host: Corn.

Injury: Mines stem and young ears.

Description and biology: Fly yellow, thorax with three broad black stripes, abdomen with brown median line and four broad brown cross bands; beak very long and thin; appendages yellow; length 3-4 mm. Larva 6-7 mm. long, shining yellowish white.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 411.

B. IMPORTANT CORN PESTS.

HEMIPTERA.

Cercopidæ.

Tomaspis varia Fabricius, *T. postica* Walker, *T. lepidior* Font.; South America. (See Sugar cane.)

COLEOPTERA.

Elateridæ.

Agriotes lineatus Linnæus. (See Tobacco.)

Chrysomelidæ.

Diabrotica graminea Ballou; Porto Rico; adults very injurious to flowers.

Brachyrhinidæ.

Diaprepes abbreviatus Linnæus; West Indies. (See Sugar cane.)

LEPIDOPTERA.

Noctuidæ.

Sesamia cretica Led.; Europe, Asia Minor, Egypt, Sudan; bores in ears. (See Sugar cane.)

Calamistis fusca Hampson; South Africa; a serious pest.

Cirphis leucosticha Hampson; East Africa; cobworm.

Pyralidæ.

Pyrausta nubilalis Hübner; Europe; bores in stalks. (See Grains.)

Chilo simplex Butler; India, Formosa. (See Sugar cane.)

Chilo auricilia Dudgeon; India. (See Rice.)

Hepialidæ.

Hepialus humuli Linnæus; Europe. (See Hops.)

COTTON.*(Gossypium* spp. Malvaceæ.)

Many species of fiber yielding cotton are cultivated in various parts of the world, and the fiber is a very important article of world commerce. The great impetus given to seed selection in recent years has also caused considerable commerce in the various varieties of seed for planting. Practically the only serious possibility of importing cotton insects is connected with the seed and with lint when not thoroughly cleaned of seed. There is also some danger of injurious insects finding refuge behind the bagging of the bales. Owing to these dangers the Federal Horticultural Board has forbidden the importation of cotton seed except through the Department of Agriculture, and has placed restrictions on the importation of foreign baled cotton.

The cotton plant is one of the most severely attacked cultivated plants, having a very long list of injurious insects. Although the majority of these insects are not liable to introduction, there is always a possibility that they may find entrance into the country in the folds of the bagging of bales or on some food plant.



FIG. 46.—Cotton stainer (*Dysdercus cingulatus*): Adult. (Maxwell-Lefroy.)

A. BETTER KNOWN COTTON INSECTS LIKELY TO BE IMPORTED.

Eriophyes gossypii Banks.

(Cotton Blister Mite. Eriophyidae; Acarina.)

Host: Cotton.

Injury: Injures the foliage, causing death to plants when very numerous. May be distributed on lint or seed.

Description and biology: A tiny four-legged mite which forms blisters on the leaves of cotton when very young, developing therein. This is a very serious pest.

Distribution: West Indies.

SMITH, LONGFIELD. Rept. Agric. Exp. Sta. St. Croix for 1912-13, Copenhagen, 1914, pp. 56-58.

Dysdercus spp.

(Cotton stainers. Pyrrhocoridae; Hemiptera.)

Important species: This genus contains the following species, which are very injurious to cotton because of their habits of sucking the juices and staining the fiber: *D. andreæ* Linnæus, West Indies. *D. annuliger* Uhler, West Indies. *D. cardinalis* Gerstäcker, of East Africa. *D. cingulatus* Fabricius, India, Ceylon, Burma, Malay Peninsula, Australia, and Egypt (see text, fig. 46). *D. delauneyi* Lethierry, Egypt, India, and the West Indies. *D. fasciatus* Signoret, Africa. *D. fernaldi* Ballou, West Indies. *D. howardi* Ballou, West Indies. *D. insularis*, Fiji. *D. nigrofasciatus* Stål, West Africa. *D. pacificus*, Fiji. *D. ruficollis* Linnæus, Brazil, Peru, and Mexico. *D. sanguinarius*, Cuba. *D. sidae* Montrousier, New South Wales. *D. superstitiosus* Fabricius, Africa. **D. suturellus* H. S., North America, West Indies.

Hosts: Cotton, okra, eggplant, and various other plants.

Injury: Serious.

Description and biology: Adult active sucking bugs, usually reddish or yellowish in color. The developmental stages are gradual, each nymphal molt showing a little more of the wings. The eggs are small, oval, yellowish, laid in clusters on the ground. The insect in all stages lives by sucking the juices of the cotton plant, especially the bolls.

BALLOU, H. A. Cotton Stainers, West India Bul., 1906, vol. 7, No. 1, pp. 64-85.

BASU, S. K., and HUTT, H. L. *Dysdercus cingulatus* Fabr.: Crop Pest Handbook for Behar and Orissa, 1913, Dept. Agr. Behar and Orissa, Calcutta, Leaflet 45, pl. 32.

***Apion xanthostylum* Wagner.**

(East African Cotton Weevil. Apionidæ; Coleoptera.)

Host: Cotton.

Injury: Bores in the stem and bolls.

Description and biology: A very small black weevil. The larva is yellowish white, 2 mm. long, curved and legless. It bores in the stem and roots as well as in the bolls of cotton and is a very serious pest.

Distribution: German East Africa.

ZACHER, FRIEDRICH. *Arbeits- Kaiserlich. Biol. Anst. f. Land- und Forstwirtschaft*, band 9, heft 1, 1913, pp. 157-163, figs. 21-27.

***Apion armipes* Wagner.**

This species is similar to the above mentioned and attacks cotton in a similar manner in Nyasaland. (Zacher., l. c., p. 156, fig. 21.)

***Anthonomus vestitus* Boheman.**

(Peruvian Cotton-Square Weevil. Curculionidæ; Coleoptera.)

Host: Cotton.

Injury: Very injurious pest to squares in Peru.

Description and biology: Adult weevil resembles the Mexican cotton boll weevil (*A. grandis*); length 2.5-4 mm.; oblong-ovate, convex, blackish piceous, rather closely clothed with elongate whitish scales, with indistinct oblique lighter band on each elytron, the two forming a basal triangle. *Pupa* white, formed in fallen squares. *Larva* white, curved, legless; feeds in the interior of cotton squares which fall to the ground soon after the larva commences to feed. *Egg* oval, white, laid in square (see text fig. 47).

Distribution: Peru.

TOWNSEND, C. H. T. *Journ. Econ. Ent.* 1911, vol. 4, No. 2, pp. 241-248.

PIERCE, W. DWIGHT. *Proc. U. S. Nat. Mus.* 1912, vol. 42, No. 1889, pp. 155-156.

PIERCE, W. DWIGHT. *U. S. Dept. Agric.*, 1915, Report 102, p. 12, pl. 2, fig. 3.

***Earias insulana* Boisduval.**

(Egyptian Cotton Bollworm. Cymbidæ; Lepidoptera.)

Host: Cotton.

Injury: Very injurious; the larvæ feed in the bolls and squares. Adults have been captured in quarantine in a few bolls of cotton from the island of Cyprus shipped for propagation and botanical purposes.

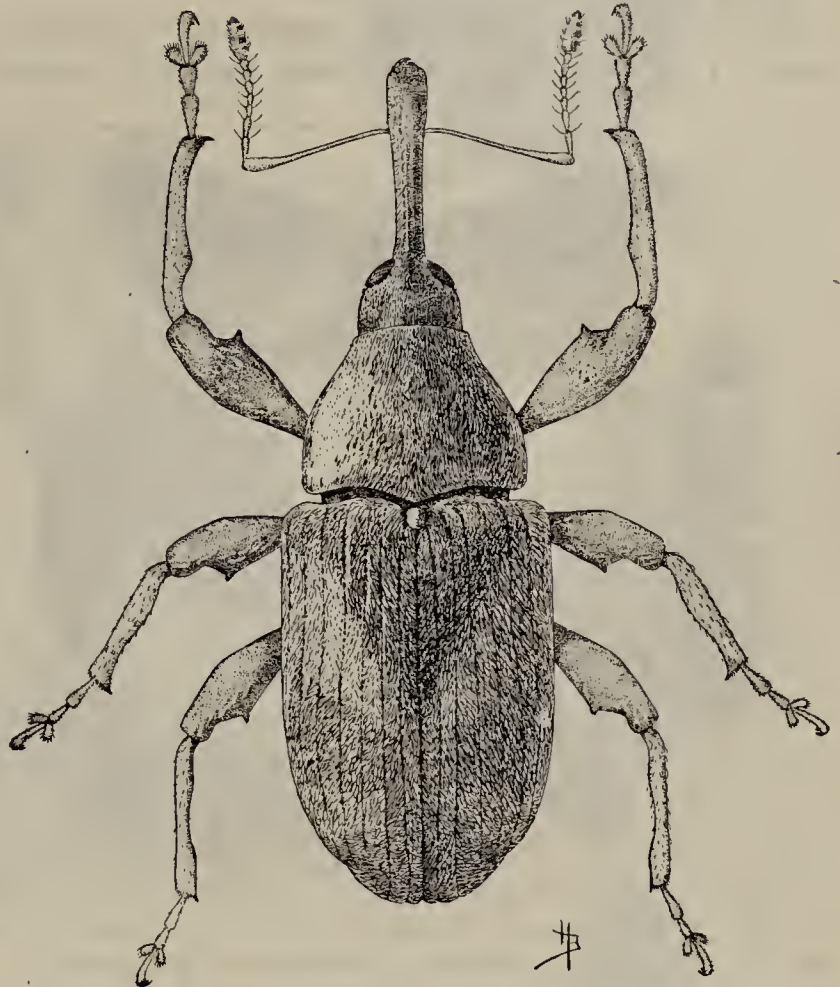


FIG. 47.—Peruvian cotton square weevil, *Anthonomus vestitus*, male. (Pierce.)

Description and biology: Adult moth green, front wings with two indistinct lines, hind wings whitish. Larva brownish to greenish with yellow flecks 15 mm. long (see plate xvi, figs. a, b, c, e, g, h).

Distribution: India, Siam, Burma, Australia, Africa, Cyprus.

ZACHER, FRIEDRICH. Arbeit. Kaiserlich. Biolog. Anst. f. Land- u. Forstwirtschaft, band 9, heft 1, 1913, pp. 175-179, figs. 35-39.

***Pectinophora gossypiella* Saunders (Gelechia).**

(The Pink Bollworm. Gelechiidæ; Lepidoptera.)

Host: Cotton.

Injury: Breeds in the bolls, especially in the seed. Liable to be imported in cotton seed. Live specimens have been taken in quarantine in the United States. Some of these were in stray seeds in baled cotton.

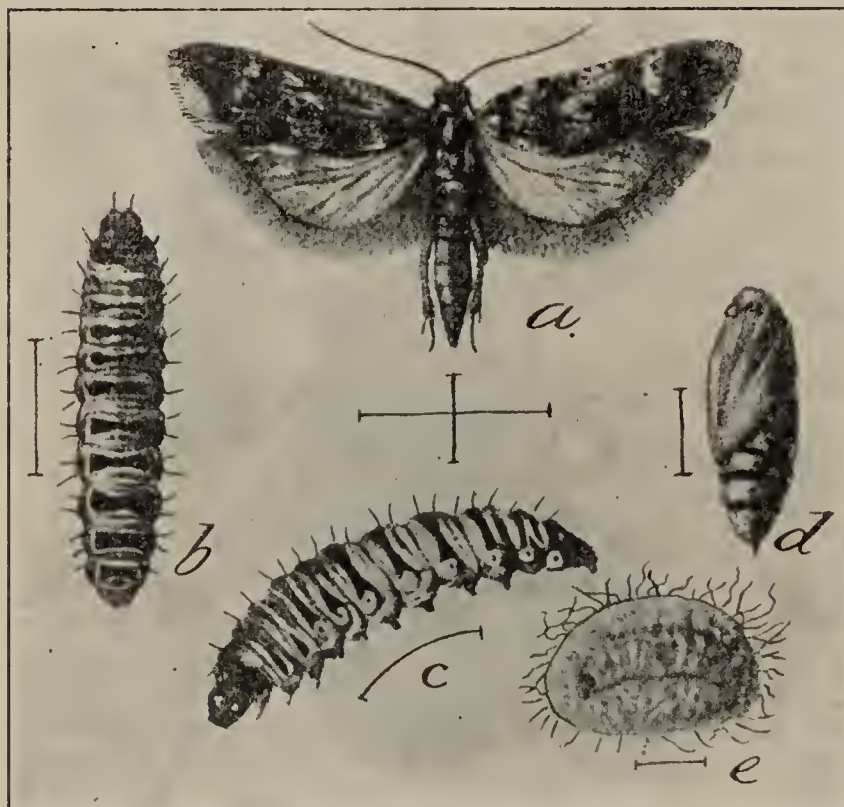


FIG. 48.—Cotton pink bollworm (*Pectinophora gossypiella*): a, Adult; b, c, larvæ; d, pupa; e, cocoon. (Maxwell-Lefroy.)

Description and biology: Moth—small, gray colored, less than half an inch long, with long brown fringes on the wings. Pupa brown, less than half an inch in length. Larva white when very young, but becoming pink; feeds in green or ripe bolls, first attacking the leaves or outside of bolls; later it bores inside of the boll, feeding on the seed. The larval period is sometimes very greatly retarded. Eggs deposited singly on leaves, stalks, and bolls hatch in a few days. (See text fig. 48.)

Distribution: India, Africa, Hawaii, New Caledonia. Has become established in the Laguna District, State of Coahuila, Mexico.

MAXWELL-LEFROY, H. F. Indian Insect Pests, pp. 93-96.

MAXWELL-LEFROY, H. F. The Insect Pests of Cotton in India, Agricultural Journal of India, vol. 1, pp. 49-62.

BASU, S. K., and DUTT, H. L. Crop Pest Handbook for Behar and Orissa, 1913, Dept. Agr. Behar and Orissa, Calcutta, Leaflet 44, pl. 31.

***Pyroderces simplex* Walsingham.**

(The Little Bollworm. Gelechiidæ; Lepidoptera.)

Host: Cotton.

Injury: Breeds in the bolls, especially in the seed.

Description and biology: Adult moth light brown, with black and white markings, length 6 mm. Larva pink; 8 mm. long. Pupa light brown, 5 mm. long. The species greatly resembles *Pectinophora gossypiella* but is smaller and differently marked. It breeds in the same manner.

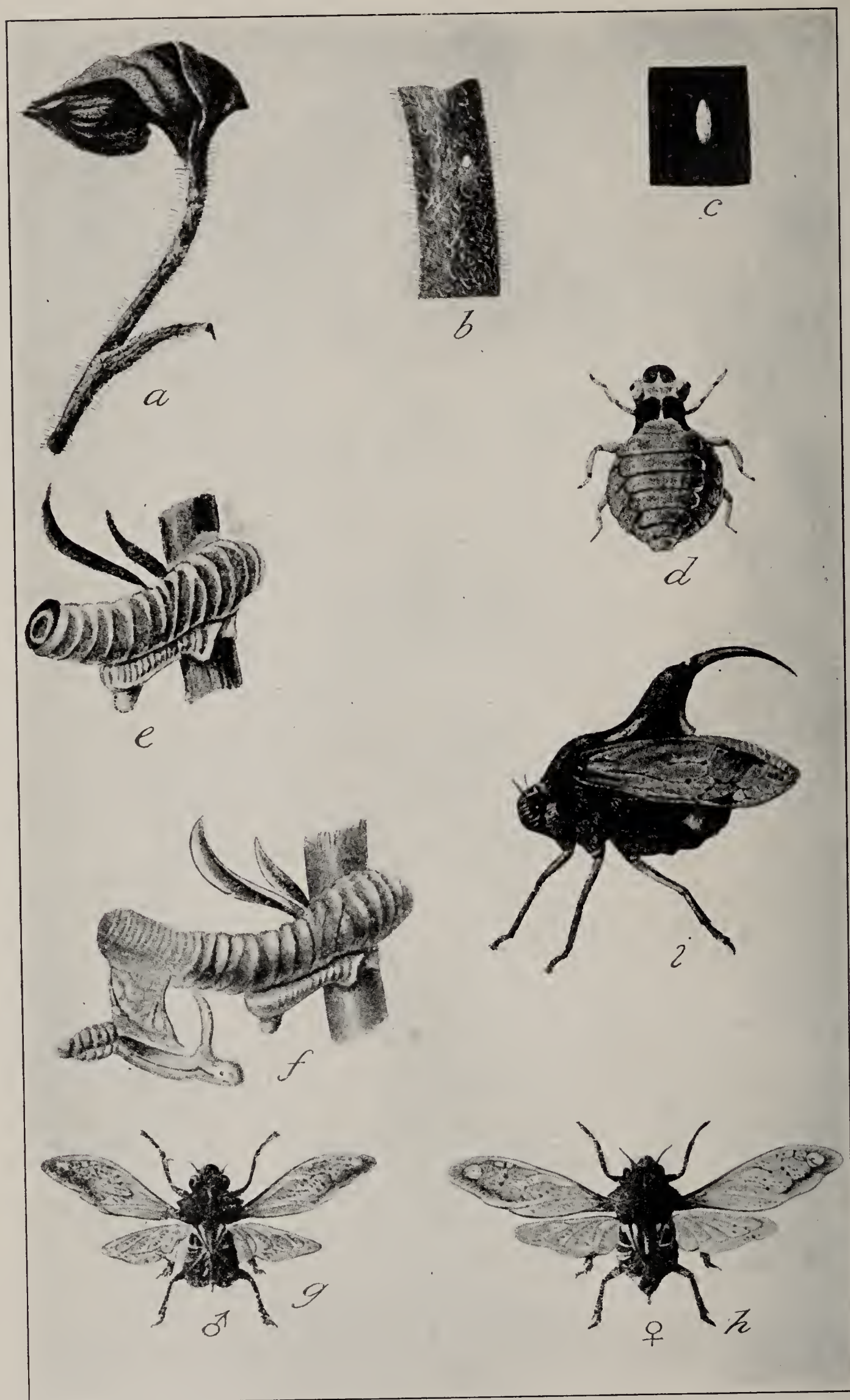
Distribution: East Africa.

MORSTATT, H. Der Pflanze, Jahrg. 10, beiheft 1, 1914, pp. 29-31.



COTTON BOLLWORMS.

Cotton bollworms: *Earias insulana*. FIGS. a, h, Larva; b, injured cotton boll; c, injured twig; e, g, adult moths. *Earias chromataria* FIG. f, Adult. *Earias fabia* Stoll. FIG. d, Adult. (Maxwell-Lefroy.)



THE COTTON SPITTLE-TUBE INSECT.

The cotton spittle-tube insect (*Macharota planitiae*): FIG. a.—Eggs on cotton stem; b, egg imbedded in tissue of stem; c, egg; d, nymph, 19 days old; e, calcareous case of nymph, 20 days old; f, case with molted skin attached; g, male; h, female; i, side view of adult. (Maxwell-Lefroy.)



THE COTTON STEM-BORER.

The cotton stem-borer (*Sphenoptera gossypii*): *a*, Larva in stalk; *b*, larva; *c*, pupa in stalk; *d*, pupa; *e*, adult; *f*, adult on plant; *g*, parasite. (Maxwell-Lefroy.)



1



2



3



4

COTTON WEEVILS.

FIG. 1.—Cottonseed weevil (*Aræcerus* sp.): Adult, pupæ, larva. FIGS. 2, 3.—Cotton-stem weevil (*Phylaitis* sp.): Adults, pupæ, larva. (Maxwell-Lefroy.) FIG. 4.—Peruvian cotton-stem weevil (*Gasterocercodes gossypii*), adult. (Pierce.)

Contarinia gossypii Felt.

(Cotton Flower Bud Maggot. Itonididæ. Cecidomyiidæ; Diptera.)

Hosts: Cotton, wild cotton, privet.*Injury:* Very serious pest of the flower buds in Antigua.

Description and biology: Adult fly 1 to 1.5 mm. long; face fuscous, yellowish, eyes large, black; mesonotum dark brown, the submedian lines yellowish; scutellum and postscutellum yellowish; abdomen greenish yellow. Pupa formed in ground. Larva 2 mm. long, changing from white to yellow or orange as it grows; infests the flower buds of cotton, causing the bracts to flare and squares to drop (see text fig. 49).

Distribution: Antigua, St. Croix.

BALLOU, H. A. The Flower-Bud Maggot of Cotton, West Indian Bull., vol. 10, No. 1, pp. 1-28, figs. 1-9.

Porricondyla gossypii
Coquillett.

(Red Maggot of Cotton.
Itonididæ [Cecidomyi-
iidæ]; Diptera.)

Host: Cotton.*Injury:* Kills growing part of plant by girdling stem.

Description and injury: Adult fly very small. Larvæ, red maggots, feed under the bark of the stems of the cotton plant, which they may completely girdle, causing the death of the parts above.

Distribution: Barbados, Montserrat.FIG. 49.—Cotton flower bud-maggot (*Contarinia gossypii*): Adult. (Ballou.)FIG. 50.—Mole cricket (*Gryllotalpa africana*). (Maxwell-Lefroy.)*Acridium peregrinum* Olivier and *A. hieroglyphicum*; Egypt and Sudan.*Acheta bimaculata* De Geer; Formosa.**Grylloidea.***Gryllotalpa africana* Pallas; India, Africa, New Holland, Tropical Asia. (See text fig. 50.)*Schizodactylus monstrosus* Drury; Egypt, Sudan, India. (See text fig. 51.)**B. IMPORTANT COTTON INSECTS.****ORTHOPTERA.****Acridiidae and Locustidae.***Chrotogonus trachypterus* Blanchard; India.

HEMIPTERA.

Cercopidæ.

Machærota planitiæ Distant; India; makes tubes on stems, sucks juices. (See pl. XVII.)

Lygæidæ.

Oxycarenus gossipinus Distant; of West Africa; *O. dudgeoni* Distant of West Africa; *O. hyalinipennis* Costa of Egypt; *O. lætus* Kirby of Ceylon, India, Burma; attack cotton seed.
Oncopeltus quadriguttatus Fabricius; Australia; oviposits in stems.

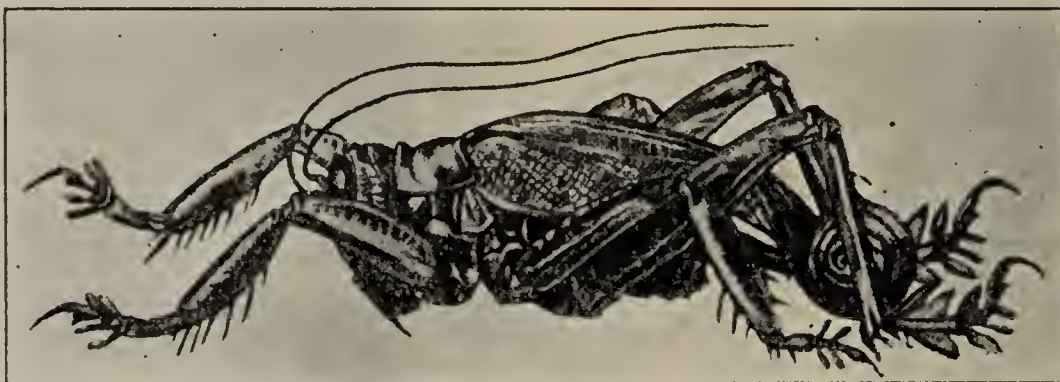


FIG. 51.—Mole cricket (*Schizodactylus monstrosus*). (Maxwell-Lefroy.)

COLEOPTERA.

Scarabæidæ.

Adoretus umbrosus Fabricius, and var. *tenuimaculatus* Waterhouse; Hawaii, Philippines, Japan, Java. (See Ro e.)

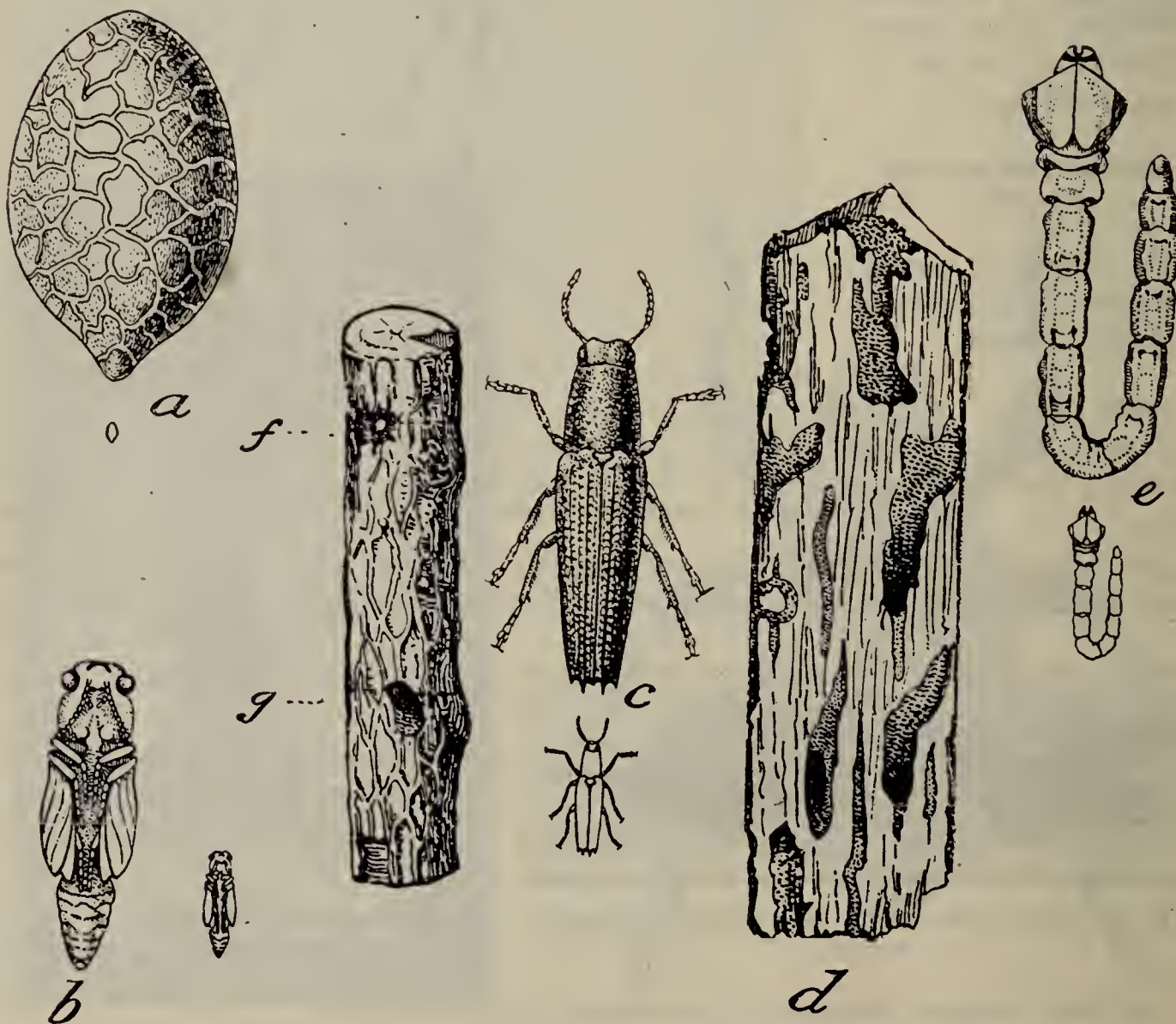


FIG. 52.—Cotton stem-borer (*Sphenoptera neglecta*): a, Egg; b, pupa, c, adult; d, f, g, injury; e, larva. (Zacher.)

Buprestidæ.

Sphenoptera neglecta Klug (see text fig. 52), Egypt, and *S. gossypii* Kerr, India; bore in stalks. (See plate XVIII.)

Curculionidæ.

Phylaitis sp.; India; and *Gasterocercodes gossypii* Pierce, Peru; bores in stalks. (See pl. XIX, figs. 2, 3, 4.) (Pierce. W. D., U. S. Dept. Agr., Off. Secy., Report 102, 1915, plate I.)

Anthribidæ.

**Araecerus fasciculatus* DeGeer; India; breeds in seed (see pl. XIX, fig. 1.) (See Corn.)

LEPIDOPTERA.

Phycitidæ.

Phycita infusella Meyrick; India; attacks buds.

Pyralidæ.

Cryptoblabes gnidiella Miller; Egypt, Europe; breeds in bolls.

Sylepta derogata Fabricius; India; rolls leaves.

Cossidæ.

Zeuzera coffeæ Nietner; Orient; bores in stalks. (See Coffee.)

Cymbidæ.

Earias fabia Stoll. (see pl. XVI, fig. d) of India, Ceylon, and Australia; *E. chromataria* Walker (see pl. XVI, fig. f) of India and Togo; *E. plaga* Feld. of East Africa; *E. chlorana* Hübner of Egypt and Java; *E. gossypii* of Egypt; boll worms.

Noctuidæ.

Euxoa segetis Schiffermiller; Europe, Asia, East Africa, Canary Islands, Madeira, South Africa; cut-worm.

Prodenia litura Fabricius; Egypt, Uganda, India, Philippines; defoliator.

Diparopsis castanea Hampson; Africa; boll worm.

Sacadodes pyralis Dyar; South America, Trinidad; boll worm.

Tarache catena Sow.; India; defoliator.

Arctiidæ.

Diacrisia obliqua Walker; India, Japan, China; defoliator.

Lymantriidæ.

Porthesia virguncula Walker; India, Uganda; defoliator.

COWPEA.

(*Vigna unguiculata* Walp. Family Leguminosæ.)

The cowpea is extensively raised in the country as well as many other parts of the world. Shipments of the peas might easily introduce pests. (See Beans, Peas.)

CRUCIFERS.

(Family Cruciferæ.)

Various insects attack several species of crucifers and for convenience are grouped under a general heading.

Phyllotreta spp.

(Crucifer Leaf Beetles. Chrysomelidæ; Coleoptera.)

Species: *Ph. undulata* Kutsch; Europe; cultivated crucifers. *Ph. nemorum* Linnaeus; Russia; rhubarb, hops, cabbage. *Ph. atra* Fabricius; Europe; crucifers. *Ph. cruciferæ* Goeze; Europe; crucifers. *Ph. nigripes* Fabricius; Europe; cabbage, radish, horseradish, rape, *Reseda*. **Ph. armoraciæ* Koch; Europe, introduced into North America; crucifers, horseradish.

Injury: The adults of all of these species feed on the foliage of cruciferous plants. The larvæ are not all known but they usually attack the stem or roots. The fact that two of the species have been introduced into this country indicates the possibility of the others also gaining admission.

Description: The first two species are yellow striped, the others unicolorous.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 525.

CHITTENDEN, F. H. U. S. Dept. Agr., Div. Entomology, bul. 9, n. s., 1897, pp. 21-28.

Ceutorhynchus contractus Marsh.

(The Charlock Weevil. Curculionidæ; Coleoptera.)

Injury: This minute weevil sometimes does great harm early in the season to young sprouting mustard plants by devouring the germinating seed or the young plant just below the surface of the ground.

Host: Charlock, (*Brassica arvensis* Linn.)

ORMEROD, E. A. 17th Report, Injurious Insects, p. 74.

CUCURBITS; MELONS; CUCUMBER.

(Family Cucurbitaceæ.)

There are many species of melons grown in various parts of the world, but the only danger of importation comes from pests of the seed and fruit.

A. BETTER KNOWN CUCURBIT INSECTS LIKELY TO BE IMPORTED.**Epilachna** spp.

(Cucurbit Ladybird Beetles. Coccinellidæ; Coleoptera.)

Species: *Epilachna chrysomelina* Fabricius; Mediterranean region, Sudan, German East Africa; cucurbits, *Sesamia*. *E. 28-punctata* Fabricius; Asia, Malaysia, Australia; Solanaceæ, Cucurbitaceæ. *E. dodecastigma* Mulsant; Asia, Malaysia, Australia; Solanaceæ, Cucurbitaceæ. *E. argus* Fourcroy; Southern Europe; *Bryonia dioica* and other cucurbits.

Injury: Defoliate.

Description: Beetle of *E. chrysomelina* round, very convex, yellowish red with six round black spots on each elytron; length 7–9 mm. The larvæ as well as the adults feed on the foliage.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 477.

Aulacophora olivieri Guérin.

(Banded Pumpkin Beetle. Chrysomelidæ; Coleoptera.)

Hosts: Cucurbitaceæ, pumpkin, marrow, cucumber, gourd, peach, nectarine.

Injury: Very serious. The adults skeletonize the leaves, and eat the flowers; the larvæ feed in the roots and lower parts of the stem.

Description: Beetle about 8 mm. long; orange yellow with large black spots at humeri and beyond middle on each elytron. The adults are rather gregarious in habits.

Distribution: Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, pt. 4, 1909; pp. 123–127, pl. 81.

Baris trægardhi Aurivillius.

(Melon Weevil. Curculionidæ; Coleoptera.)

Hosts: Sweet melons.

Injury: Breeds in the fruit among the seed.

Description and biology: Adult weevil 4 to 6 mm. long, black, with a long slender, curved beak, antennæ elbowed and clubbed. Pupa white, with appendages folded beneath. Larva white, legless, with light brownish head.

Distribution: Sudan.

KING, H. H. Fourth Rept. Wellcome Tropical Research Laboratories, 1911, vol. B, Genl. Science, p. 137, pl. 8, figs. 1, 3, 4, 6.

Carpomyia pardalina Bigot.

(Melon Fruit Fly. Trypetidæ; Diptera.)

Hosts: Melons.*Injury:* Serious.*Description and biology:* Adult fly, wing expanse 11 mm., wings with three yellowish bands, color light brown, thorax with black and white spots. Larva feeds in fleshy fruits, pupates in the soil. Egg laid in skin of fruit.*Distribution:* India.

MAXWELL-LEFROY, H. M. Mem. Dept. Agric., India, 1907, vol. 1, No. 2, p. 229, fig. 72.

Dacus cucurbitæ Coquillett.

(Cucurbit Fly. Trypetidæ; Diptera.)

Hosts: Cucurbitaceæ (melons, gherkins, etc.), tomatoes, beans.*Injury:* Breeds in fruits and stems.*Description and biology:* Fly marked with red, brown, yellow, black, and white; wing with brown band and apical spot. Eggs laid on skin of fruit.*Distribution:* India, Ceylon, Hawaii.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 415, 416.

B. OTHER IMPORTANT CUCURBIT INSECTS.

DIPTERA.

Trypetidæ.*Ceratitis capitata* Wiedemann, attacks squash. (See Fruit.)*Dacus ferrugineus* Fabricius; India, etc. (See Fruit.)*Bactrocera tryoni* Froggatt; Orient. (See Fruit.)*Rhagoletis pardalina* Bigot; India; attacks fruit.

LEPIDOPTERA.

Pyralidæ.**Pionea ferrugalis* Hübner; Europe, Asia, North America. (See Cabbage.)**CURRANT.**

See Gooseberry.

CUSTARD APPLE; SOUR SOP.

(Annona spp. Family Anonaceæ.)

Tropical trees cultivated for their large fruits. Some of the species have been introduced into Florida.

A. A BETTER KNOWN SPECIES LIKELY TO BE IMPORTED.**Anonæpestis bengalella** Ragonot.

(Custard-apple Caterpillar. Phycitidæ; Lepidoptera.)

Host: Custard apple (*Annona squamosa*).*Injury:* Injures fruit by tunneling.*Description:* Adult female length 22 mm.; fore wings dark green; hind wings brownish-gray with purplish tint, head and thorax brownish-ochreous, abdomen ochreous.*Distribution:* India.

MOORE, F. Indian Museum Notes, 1896, vol. 3, No. 3, p. 106.

B. OTHER IMPORTANT ANNONA INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Aspidiotus (*Chrysomphalus*) *personatus* Comstock; Porto Rico; *Annona reticulata*, *A. muricata*.*Aulacaspis miranda* Cockerell; Mexico; *Annona cherimola*.

Coccidæ—Continued.

Unarmored—

Ceroplastes denudatus Cockerell; Grenada, Antigua, Demerara; *Annona muricata*.

Ceroplastes quadrilineatus Newstead; British East Africa, Uganda; *Annona muricata*.

* *Ceroputo yuccæ* Coquillett; Mexico, California; *Annona cherimola*.

Coccus marsupialis Green; Ceylon.

Icerya albolutea Cockerell; West Africa; *Annona squamosa*.

Lagosinia strachani Cockerell; W. Africa; *Annona squamosa*.

* *Pseudococcus bromeliæ* Bouché; Hawaii; *Annona muricata*.

* *Saissetia nigra* Nietner; West Indies; Ceylon.

LEPIDOPTERA.

Pyralidæ.

Dichocrocis punctiferalis Guénée; Queensland. (See Corn.)

DIPTERA.

Trypetidæ.

Anastrepha fraterculus Wiedemann, attacks *Annona humboldtiana*. (See Fruit.)

Ceratitis capitata Wiedemann; attacks *Annona muricata*. (See Fruit.)

Ceratitis anonæ Graham; Africa; attacks *Annona muricata*. (See Fruit.)

CYPRESS.

(*Cupressus* spp. Family Juniperaceæ.)

Trees or shrubs with aromatic evergreen foliage in Central America.. California, Arizona, Southern Europe to Southeast Asia, valuable for timber and ornament.

INSECTS INJURIOUS TO CYPRESS (CUPRESSUS).

HEMIPTERA.

Coccidæ:

Armored—

* *Chionaspis striata* Newstead; Algeria, Egypt, California, Arizona.

Diaspis visci Schrank; Europe; *Cupressus funebris*, *C. glauca*, *C. macrocarpa*, *C. pyramidalis*, *C. sempervirens*.

Unarmored—

Gueriniella serratulæ Fabricius; Algeria, Southern France.

COLEOPTERA.

Buprestidæ.

Diadoxus scalaris L. & G., and *D. erythrurus* White; Australia; bore in *Cupressus lambertiana*.

BIBLIOGRAPHY.

LINDINGER, L., Die Schildläuse (Coccidæ), 1912.

FROGGATT, W. W., Australian Insects, 1907.

CYPRESS; CEDAR.

(*Chamæcyparis* spp. Family Juniperaceæ.)

Evergreen trees of North America and Japan, highly valued for timber and useful ornamental trees.

INSECTS INJURIOUS TO CHAMÆCYPARIS.

HEMIPTERA.

Coccidæ:

Armored—

Diaspis visci Schrank; Europe; *Chamæcyparis nutkaensis*, *C. obtusa*, *C. pisifera*.

BIBLIOGRAPHY.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

DATE PALM.

(*Phoenix dactylifera*. Family Palmaceæ.)

A palm cultivated for its fruit, the date of commerce. (See Palms.)

DOGWOOD.

(Cornus spp. Family Cornaceæ.)

Hardy ornamental shrubs or trees of the northern hemisphere and Peru. The bark of some species is used in obtaining a substitute for quinine, for tooth powder, black ink, etc.; the bark of the roots yields a scarlet dye, the wood is hard and good for tool handles.

IMPORTANT DOGWOOD INSECTS.**HEMIPTERA.****Coccidæ:**

Armored—

Chionaspis salicis Linnæus; Europe; *Cornus sanguinea*.

Unarmored—

Lecanium coryli Linnæus; Europe; *Cornus sanguinea*, *C. sericea*.**DURRA.**

See Sorghum.

EGGPLANT.

(Solanum melongena. Family Solanaceæ.)

A tropical vegetable now extensively cultivated in this country for its fruit.

A. EGGPLANT INSECT LIKELY TO BE IMPORTED.**Leucinodes orbonalis** Guénée.

(Eggplant Fruit Borer. Pyralidæ; Lepidoptera.)

Host: Eggplant.*Injury:* Bores in the fruit.

Description and biology: Adult wing expanse 24 mm., white, forewing with fulvous, black and ferruginous markings; hind wing white, with black lines and specks. *Larva* about 15 mm. long, flesh color, with brown head and shield; a few short hairs on round dark spots.

Distribution: India, Java, Burma, Ceylon, South Africa.

MAXWELL-LEFROY, H. M. Mem. Dept. Agric. India, vol. 1, 1907, p. 214, fig. 65.

B. IMPORTANT EGGPLANT INSECTS.**DIPTERA.****Trypetidæ.***Lonchæa splendida*; New Zealand, Australia, Oceanica; attacks fruit. (See Tomato.)**LEPIDOPTERA.****Noctuidæ.***Micromima olivia*; Cuba; leaf roller on tomato, tobacco and eggplant.**ELM.**

(Ulmus spp. Family Urticaceæ.)

Ornamental deciduous trees distributed throughout the colder and temperate regions of the northern hemisphere, some of them much valued as avenue trees. The wood is very hard and valuable in the manufacture of implements.

IMPORTANT ELM INSECTS.**HEMIPTERA.****Aphididæ.**

Colopha compressa Koch, *Eriosoma lanuginosa* Hartig, *Tetraneura pallida* Haliday, *Eriosoma ulmi* Linnæus, *Tetraneura ulmi* DeGeer; Europe; attack foliage of elms.

Coccidæ.

Armored—

Chionaspis salicis Linnæus; Europe; *Ulmus campestris*.

Coccidæ—Continued.

Unarmored—

**Gossyparia spuria* Modeer; Europe.*Gueriniella serratulæ* Fabricius; Italy.*Lecanium coryli* Linnæus; Europe; *Ulmus campestris*, *U. montana*.

COLEOPTERA.

Bostrychidæ.*Sinoxylon perforans* Schr.; Europe; bores in branches.*Xylomyces retusus* Olivier; Europe; bores in branches and trunks.**Buprestidæ.***Lampra decipiens* Mannerheim and *L. rutilans* Fabricius; Europe; bore in the bark, bast and sap-wood.**Scarabæidæ.***Melolontha hippocastani* Fabricius and *M. melolontha* Linnæus; Europe; larvæ injure roots of seedlings.FIG. 53.—Elm barkbeetle (*Scolytus multistriatus*): Adult. (Nüsslin.)*Scolytus mali* Bechst.; Europe.*Scolytus multistriatus* Marsham; Europe (see text fig. 53).*Scolytus scolytus* Fabricius; Europe; attacks all parts of trunk and branches.*Xyleborus dryographus* Ratzeburg and *X. monographus* Fabricius; Europe; galleries in wood.**Cerambycidæ.***Acolesthes sarta* Solsky; India; bores in trunks.*Oberca linearis* Linnæus; Europe; bores in pith of nursery stock of cork elm.**Curculionidæ.***Magdalis aterrima* Linnæus; Europe; makes galleries under the bark and in injured branches.*Orchestes alni* Linnæus; Europe; mines the leaves of *Ulmus campestris*.*Orchestes ferrugineus* Marsham and *O. rufus* Olivier; Europe mine the leaves.**Scolytidæ.***Pteleobius kraatzi* Eichhoff; Russia; galleries in bark.*Pteleobius vittatus* Fabricius; Germany, Russia; galleries in bark.*Scolytochelus ensifer* Eichhoff; Russia; galleries in bark of branches.*Scolytochelus kirschi* Skal.; Russia; galleries in bark of smooth bark elms.*Scolytus lævis* Chapuis and *S. pygmaeus* Fabricius; Europe; galleries in bark of tops and branches.

LEPIDOPTERA.

Cossidæ.*Cossus cossus* Linnæus; goat moth; Europe; bores in wood. (See Willow.)**Zeuzera pyrina* Linnæus; Europe; bores in wood. (See Horse chestnut.)**Notodontidæ.***Phalera bucephala* Linnaeus; Europe. (See Forests.)**Noctuidæ.***Xylina socia* Rott.; Europe. (See Plum.)**Geometridæ.***Boarmia crepuscularia* Hübner; Europe, Asia. (See Cinchona.)*Hibernia defoliaria* Linnæus; Europe; defoliator.*Larentia dilutata* Borekh.; Europe; defoliator.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

HESS, R. Der Forstschutz, 1898, 1900.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-87.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

EUCALYPTUS; GUM.*(Eucalyptus spp.)*

Valuable Australian trees recently introduced into California.

A. BETTER KNOWN EUCALYPTUS INSECTS LIKELY TO BE IMPORTED.***Mictis profana* Fabricius.***(Gum-tree Bug. Coreidæ; Hemiptera.)*

Hosts: Eucalyptus viminalis, Acacia decurrens, A. mollissima, orange, other citrus fruits.

Injury: Sucks the juices from tender twigs, causing death of the new parts.

Description: A large brown bug about an inch long, with long sucking proboscis, with acute teeth at posterior corners of thorax. Greatly resembles Leptoglossus. The immature stages are soft and marked with yellow.

Distribution: Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, pt. 4, 1909, pp. 68-71, pl. 70.

Stigmodera heros* Gehin.(She-Oak Root Borer. Buprestidæ; Coleoptera.)*

Hosts: She-oak and Bull-oak (Casuarina); also Eucalyptus. Adults frequent flowers of Melaleuca, etc.

Injury: Tunnels in the lower portions of the trunk of trees.

Description and biology: Beetles large yellowish brown with dark blackish legs. Larvæ large yellowish white with powerful jaws. The eggs are laid in areas cleared by the female in the butts of the trees. The larvæ bore in and down through the wood for several feet.

Distribution: Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, pt. 5, 1911, pp. 114-116, pl. 121.

Phoracantha tricusps* Newman; *Phoracantha recurva* Newman.(Yellow-box Borers. Cerambycidæ; Coleoptera.)*

Hosts: Eucalyptus viminalis.

Injury: Very destructive borers.

Description: Beetles light brown with darker markings on the elytra. The head and thorax are very dark brown. Pupæ yellowish white. Larvæ bore in the wood. Eggs are deposited in crevices in the bark.

Distribution: Victoria.

FRENCH, C. Handbook of Destructive Insects of Victoria, pt. 5, 1911, pp. 70-73, pl. 112.

Distichocera macleayi* Newman.(Feathery-horned Yellow-box Borer. Cerambycidæ; Coleoptera.)*

Hosts: Eucalyptus stuartiana, E. viminalis.

Injury: Bores in the wood.

Description: Female beetle reddish brown in color, larger than the male, which is black with beautiful featherlike antennæ. Pupa yellowish white. Larva dull, yellowish white, unusually tapering at apex. The adults frequent the flowers of the Leptospermum bushes.

Distribution: Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, pt. 5, 1911, pp. 96-98, pl. 107.

Trypocharia mastersi Pascoe.

(Masters' Gum Borer. Cerambycidae. Coleoptera.)

*Hosts: Eucalyptus amygdalina, E. globulus.**Injury:* Bores in the wood, the larvæ taking several years for development.*Description:* Adult over an inch long, with long antennæ, brown, with broad yellow elytral band; thorax laterally dentate. Pupa elongate white. Larva cylindrical yellowish, with small head and broader prothorax, chitinous.*Distribution:* Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, pt. 4, 1909, pp. 98-101, pl. 76.

Bimla femoralis Saunders.

(Apple-gum Borer. Cerambycidae; Coleoptera.)

*Host: Eucalyptus stuartiana.**Injury:* Bores in the trunk, causing much damage. A severe scar appears on the surface of the bark where the burrow commences.*Description:* The sexes are different in appearance, the male having antennæ much larger than the body; the female antennæ considerably shorter than the body. Elytra with yellow band at base, remainder of elytra brown. Head, thorax and tip of abdomen yellow in female; head and center of prothorax brown in male. Larva of female much broader, less attenuate, and with larger prothorax than in adult female.*Distribution:* Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, pt. 4, 1909, pp. 110-113, pl. 78.

Strongylorhinus ochraceus Schaum.

(Red Gum-tree Weevil. Curculionidæ; Coleoptera.)

*Host: Eucalyptus melliodora.**Injury:* Larvæ bore in twigs causing gall-like deformation. Very injurious.*Description:* A reddish-brown weevil about 12 mm. long with short, stout beak. Larva curved, legless, white, makes a cone shaped burrow in the wood.*Distribution:* Australia.

FRENCH, C. Handbook of Injurious Insects of Victoria, pt. 4, 1909, pp. 128-130, pl. 82.

B. OTHER IMPORTANT EUCALYPTUS INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Aspidiotus (Aonidiella) miniata Green; Australia; *Eucalyptus miniata*.*Aspidiotus alatus* Froggatt; Australia; *Eucalyptus rostrata*.*Aspidiotus confusus* Froggatt; Australia.*Aspidiotus tasmaniæ* Green; Australia.*Chionaspis frenchi* Green; Australia.*Lecaniodiaspis converus* Froggatt; Australia.*Lecaniodiaspis frenchi* Froggatt; Australia.*Lecaniodiaspis newmanni* Froggatt; Australia.

Unarmored—

Apiomorpha attenuata Froggatt; Australia.*Apiomorpha bäuerleni* Froggatt; Australia.*Apiomorpha calycina* Tepper; South Australia; *Eucalyptus dumosa*, *E. oleosa*.*Apiomorpha conica* Froggatt; Australia; *Eucalyptus viminalis*, *E. uncinata*.*Apiomorpha duplex* Schrader; Australia.*Apiomorpha ellipsoidalis* Tepper; Australia.*Apiomorpha floralis* Froggatt; Australia.*Apiomorpha helmsii* Fuller; Australia.*Apiomorpha karschi* Rübsaamen; Australia.*Apiomorpha maliformis* Fuller; Australia; *Eucalyptus patens*.*Apiomorpha minor* Froggatt; New South Wales; *Eucalyptus hæmastoma*.

Coccidæ—Continued.**Unarmored—Continued.**

- Apiomorpha munita* Schrader; Australia; *Eucalyptus robusta*, *E. siderophloia*.
Apiomorpha ovicola Schrader; Australia; *Eucalyptus hæmastoma*, *E. gracilis*, *E. leucorylon*, *E. rostrata*.
Apiomorpha ovicoloides Tepper; Australia; *Eucalyptus incrassata*.
Apiomorpha pedunculata Fuller; Australia.
Apiomorpha pharetrata Schrader; New South Wales; *Eucalyptus sieberiana*, *E. corymbosa*, *E. capitellata*.
Apiomorpha pileata Schrader; New South Wales.
Apiomorpha pomiformis Froggatt; Australia; *Eucalyptus rostrata*.
Apiomorpha rugosa Froggatt; Australia.
Apiomorpha sessilis Froggatt; Australia.
Apiomorpha sloanei Froggatt; Australia.
Apiomorpha strombylosa Tepper; Australia; *Eucalyptus incrassata*.
Apiomorpha thornntoni Froggatt; Australia.
Apiomorpha umbellata Froggatt; Australia.
Apiomorpha urnalis Tepper; New South Wales; *Eucalyptus uncinata*, *E. gracilis*, *E. melliodora*, *E. polyanthemos*.
Apiomorpha variabilis Froggatt; Australia; *Eucalyptus piperita*.
Ascelis attenuata Froggatt; Australia; *Eucalyptus piperita*.
Ascelis echiniformis Fuller; West Australia; *Eucalyptus tessellaris*.
Ascelis præmollis Schrader; Australia; *Eucalyptus corymbosa*.
Ascelis schraderi Froggatt; Australia; *Eucalyptus corymbosa*.
Ceronema caudata Froggatt; Australia; *Eucalyptus robusta*.
Ctenochiton eucalypti Maskell; Australia; *Eucalyptus siderophloia*.
Eriococcus confusus Maskell; Australia; *Eucalyptus viminalis*.
Eriococcus coriaceus Maskell; Australia.
Eriococcus eucalypti Maskell; Australia, Tasmania; *Eucalyptus diversicolor*.
Eriococcus simplex Maskell; Australia.
Eriococcus crofti Froggatt; Australia; *Eucalyptus piperita*.
Eriococcus gregarius Froggatt; Australia, New Zealand.
Eriococcus irregularis Froggatt; Australia; *Eucalyptus piperita*.
Eriococcus serratilobis Green; Australia; *Eucalyptus gracilis*.
Eriococcus picta Froggatt; Australia.
Eriococcus tessellatus Froggatt; Australia.
Eriococcus spiniger Maskell; Australia.
Eriococcus tepperi Maskell; Australia, Tasmania; *Eucalyptus globulus*.
Opisthoscelis conica Fuller; Australia.
Opisthoscelis fibularis Froggatt; Australia.
Opisthoscelis globosa Rübsaamen; New South Wales; *Eucalyptus capitellata*.
Opisthoscelis maculata Froggatt; New South Wales; *Eucalyptus gracilis*, *E. leucorylon*.
Opisthoscelis mammularis Froggatt; Australia.
Opisthoscelis maskelli Froggatt; Australia.
Opisthoscelis nigra Froggatt; Australia.
Opisthoscelis pisiformis Froggatt; New South Wales, Australia; *Eucalyptus melliodora*, *E. robusta*, *E. resinifera*, *E. piperita*.
Opisthoscelis serrata Froggatt; Australia.
Opisthoscelis spinosa Froggatt; Australia; *Eucalyptus siderophloia*.
Opisthoscelis subrotunda Schrader; Australia; *Eucalyptus capitellata*.
Opisthoscelis verrucula Froggatt; Australia.
Pseudococcus lobulatus Maskell; Australia; *Eucalyptus globulus*.

ISOPTERA.**Termitidæ.**

- Termes australis* Hagen; Australia. (See Apple.)

LEPIDOPTERA.**Arctiidæ.**

- Nola metallopa* and *Spilosoma fuscina*; Australia; attacks the foliage.
Termissa nivosa; Australia; larvæ found under the bark in August.

Bombycidæ.

- Ocinara lewinii* Lewin; Australia; attacks foliage.

Geometridæ.

- Crypsiphona occultaria* and *Gastrophora henricaria*; Australia; defoliate.
Mnesampela privata Gn.; Australia; defoliator.

Laslocampidæ.

Odonestis australasiæ Fabricius; Australia; defoliator.

Lymantridæ.

Teara contraria Walker; and *Trichetra marginalis*, Australia; defoliators

Hepiolidæ.

Charagia lignivora Lewin; Australia. (See Apple.)

DIPTERA.

Itonididæ (Cecidomyiidæ).

Diplosis eucalypti Skuse, *D. paralis* Skuse, and *Lasioptera miscella* Skuse; Australia; breed in twigs.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

FROGGATT, W. W. Australian Insects.

EUGENIA spp.

(Family Myrtaceæ.)

Fruit-bearing trees of South America, etc., cultivated in the Southern States and California.

DIPTERA.

Trypetidæ.

Anastrepha fraterculus Wiedemann. (See Fruit.)

Ceratitis capitata Wiedemann, attacks *Eugenia braziliensis*, *E. jambos*, *E. malaccensis*, *E. uniflora*. (See Fruit.)

Dacus ferrugineus Fabricius; India, etc., attacks fruit of *Eugenia malaccensis*. (See Fruit.)

FIG; ASSAM RUBBER; BANYAN.

(*Ficus* spp. Family Urticaceæ.)

This is a very large genus of valuable plants, including the fig (*Ficus carica*), the India or Assam rubber plant (*F. elastica*), and the banyan (*F. benghalensis*). Many varieties of the fig are prized for their fruit. The India rubber of commerce is derived from *F. elastica*. Other varieties are popular in conservatories.

A. BETTER KNOWN FIG INSECTS LIKELY TO BE IMPORTED.

Sinoxylon sudanicum Lesne.

(Fig stem-boring beetle. Bostrychidæ; Coleoptera.)

Host: Fig.

Injury: Bores in the twigs of young trees.

Description and biology: Adult beetle, brown with basal half of elytra tinged with yellow, about one-quarter inch long. The apex of the elytra is concave bituberculate. The adult bores in twigs near the buds and girdles the twig under the bark, laying its eggs in the outer portion which soon falls to the ground. The species is especially dangerous to nursery stock just planted, as it does not usually attack strong healthy trees.

Distribution: Sudan.

KING, HAROLD H. Fourth report. Wellcome Tropical Research Lab. Khartoum, vol. B, Gen'l Science, p. 140, pl. 9, fig. 1.

Colobogaster quadridentata Fabricius.

(Family Buprestidæ; Coleoptera.)

Host: Cultivated fig (*Ficus carica*).

Injury: Injury occasioned by galleries made by larvæ in trunk and twigs. Liable to be introduced in cuttings or plants.

Description and biology: Adult beetle 25–30 mm. long, 11–12 mm. broad; blue black, with small points of metallic green. Practically entire life spent in plant.

Distribution: Brazil.

BONDAR, GREGORIO: Os insectos damninhos no Agricultura, 1913, p. 4.

Batocera boisduvali Hope.

(Fig-tree borer. Family Cerambycidae; Coleoptera.)

Hosts: *Ficus macrophylla*, *F. australis*.

Injury: Bores in stems and branches of damaged and freshly fallen trees.

Adult: A beautiful grayish-green beetle, about 2 inches long, with a row of white marks on the elytra; very strong, heavy antennae; prothorax laterally armed with very strong spine on each side. Pupa light brown. Larva about 3 inches long, very robust, head black.

Distribution: Queensland.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1911, pt. 5, pp. 134–137, pl. 126.

Tæniotes scalaris Fabricius.

(Family Cerambycidae; Coleoptera.)

Host: Cultivated fig (*Ficus carica*).

Injury: Injury due to galleries made by larvæ.

Description and biology: Adult beetle 15–30 mm. in length; general color obscure, nearly black, with spots and streaks of yellow; triangular spot between the eyes, and behind the eyes is situated a half-moon-like spot. Practically entire life is spent in the plant.

Distribution: Brazil.

BONDAR, GREGORIO: Os insectos damninhos no Agricultura, 1913, p. 9, figure.

Hellipus bonelli Boheman.

(Brazil Fig Borer. Curculionidæ; Coleoptera.)

Host: Cultivated fig (*Ficus carica*).

Injury: Larvæ make galleries in trunks and branches of fig. Liable to be introduced on plants or cuttings.

Description and biology: Adult weevil 12 mm. long, with characteristic designs on thorax and elytra, color light coffee brown, with symmetrical yellow spots. Larvæ and pupæ white. Practically the whole life cycle is spent in the tree.

Distribution: Brazil.

BONDAR, GREGORIO. Os insectos damninhos no Agricultura, 1913, p. 11. Figures injury, larvæ, pupa, and adult.

Hylesinus porcatus Chapuis.

(The Fig-Branch Borer. Scolytidæ; Coleoptera.)

Host: Fig.

Injury: Occasioned by tunneling of insect. Liable to be imported in cuttings or plants.

Description and biology: Adult beetle short, thickset, rounded, general color black, varying to reddish brown in immature specimens; head and thorax slightly rugose and lightly covered with fine hairs. Breeds in galleries in twigs, entering just above a bud. (See plate xx.)

Distribution: New South Wales.

FROGGATT, W. W. Agric. Gaz. New South Wales, 1899, vol. 10, pt. 4, p. 268.

B. OTHER IMPORTANT FICUS INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

- Aspidiotus (Aonidia) planchonioides* Green; Ceylon (Botanic Gardens).
 **Aspidiotus (Aonidiella) cocotiphagus* Marlatt; Cuba.
Aspidiotus (Aonidiella) subcuticularis Green; Australia; *Ficus orbicularis*.
Aspidiotus (Chrysomphalus) personatus Comstock; West Indies; Mexico; British Guiana; England (in greenhouses).
Aspidiotus (Diaspidiotus) africanus Marlatt; South Africa.
Aspidiotus (Morganella) maskelli Cockerell; Bermuda.
 **Aspidiotus (Pseudaonidia) articulatus* Morgan; Jamaica.
Aspidiotus (Pseudaonidia) clavigera Cockerell; Honolulu.
Aspidiotus (Pseudaonidia) silvatica Lindinger; German East Africa, Kamerun; *Ficus indica*.
Aspidiotus (Pseudaonidia) trilobitiformis Green; East India, Ceylon, Mauritius, Japan, Brazil; *Ficus scandens* (see text fig. 32.)
Aspidiotus (Pseudaonidia) obsita Cockerell and Robinson; Philippines; *Ficus caudatifolia*.
Schizaspis lobata Cockerell and Robinson; *Ficus nota*.
Chionaspis manni Green; India.
 **Conchaspis angræci* Cockerell; established in Florida, and has doubtless been imported from Mexico and Jamaica on numerous occasions. Scale of female approximately circular, conical, apex bluntly pointed, radiating from apex are six to eight strong ridges or carinæ.
Diaspis bromeliæ (Kern); Mexico.
Hemichionaspis fici Green; Bengal; *Ficus glomerata*, *F. carica*.
Hemichionaspis minima Green; India.
Lepidosaphes ficifolii Berlese; Algeria, Italy; *Ficus carica*.
Lepidosaphes mexicana Cockerell; Mexico.
Lepidosaphes minima Newstead; Algeria; *Ficus carica*.

Unarmored—

- Anomalococcus cremastogastri* Green; Ceylon; *Ficus religiosa*.
Asterolecanium pustulans Cockerell; Jamaica, Porto Rico, Antigua, Brazil, British Guiana, Grenada, Montserrat; fig.
Ceroplastes ceriferus Anderson; Ceylon; *Ficus walkeriana*.
Ceroplastes ficus Newstead; German East Africa; test of adult female hemispherical, thin, semitransparent shaded with gray and brown.
Ceroplastes gowdeyi Newstead; Uganda Protectorate.
Ceroplastes myricæ Linnæus; Greece; fig.
Ceroplastes quadrilineatus Newstead; British East Africa; test of adult provided with a pair of large divergent pyriform bodies, four white lines across dorsum.
Ceroplastes rubens Maskell; Australia, Hawaii, Japan; *Ficus macrophylla*.
Ceroplastes rusci Linnaeus; Europe, British Guiana, Algeria, Australia, Japan; adult female covered with wax in the form of plates; attacks *Ficus elastica* and *F. carica*.
Ceroplastes townsendi percrassus Cockerell; Mexico; adult female covered with wax of a faint yellowish tint without division into plates.
Ceroputo yuccæ Coquillett; Mexico.
Drosicha maskelli Cockerell; Japan, China, Java.
Eriococcus crispus Fonscolombe; France.
Eriococcus lagerstræmiæ Kuwana; Japan.
Icerya ægyptiaca Douglas; Egypt; adult female forms a white waxy secretion; along the margin of the body are fragile white processes.
Icerya palmeri Riley & Howard; Guatemala.
Icerya maxima Newstead; Africa.
Icerya seychellarum Westwood; Natal, Africa. (See Citrus.)
Lecaniodiaspis africana Newstead; Egypt.
Lichtensia lutea Cockerell; Mexico; fig.
Monophlebus stebbingi octocaudata Green; India; *Ficus carica*, *F. benghalensis*, *F. infectoria*, *F. religiosa*, *F. glomerata*; adult male provided with four fleshy tassels on each side of the abdomen.
Neolecanium plebeium Cockerell; Mexico.
Paralecanium expansum Green; India, Australia; *Ficus retusa*.
Pseudococcus ficus Signoret; France, Calabria.
Pseudococcus setosus Hempel; Brazil.
Pseudococcus virgatus Cockerell; Africa.
Pulvinaria ficus Hempel; Brazil.
Pulvinaria jacksoni Newstead; W. Africa.
Pulvinaria mammeæ Maskell; Natal; fig.
 **Saissetia nigra* Nietner; Hawaii, Ceylon, West Indies, India; *Ficus glomerata*.

Coccidæ—Continued.

Unarmored—Continued.

Tachardia fici Green; India; *Ficus religiosa*.

Tachardia lacca Kerr; British Guiana, India, Ceylon; *Ficus elastica*, *F. carica*, *F. glomerata*, *F. indica*, *F. infectoria*, *F. laccifera*, *F. nervosa*, *F. obtusifolia*, *F. religiosa*, *F. rumphii*, *F. tjakela*, *F. comosa*, *F. cordifolia*, *F. cunia*, *F. palmata*.

Vinsonia stellifera Walker; British Guiana; *Ficus altissima*. (See Coffee.)

Pentatomidæ.

Peltophora pedicillata Kirby; Australia. (See Plum.)

COLEOPTERA.

Buprestidæ.

Lampra assamensis Stebbing; India; on *Ficus elastica*.

Chrysomelidæ.

Crioceris impressa Fabricius; India; feeds on foliage of *Ficus elastica*.

Podontia 14-punctata Linnæus; India; a defoliating leaf beetle on *Ficus elastica*.

Cerambycidæ.

Xoanodera regularis Gahan; India; bores between the bast and sapwood of *Ficus elastica*.

Xylotrechus gahani Stebbing; India; bores in the branches of *Ficus elastica*.

Batocera rubra Linnæus; India; bores in the trunk of fig trees (*Ficus carica*), causing much injury. (See pl. XXI.)

Batocera albofasciata DeGeer; India, Java, Kamerun; an important borer in *Ficus elastica*.

Batocera frenchi; Australia; bores in native fig trees.

Olenecamptus bilobus Fabricius; India; bores in *Ficus rumphii*, *F. glomerata*, and *F. roxburghii*.

Phryneta spinator Fabricius; East Africa; bores in *Ficus elastica*.

Phryneta conradti Kolbe, East Africa; bores in *Ficus elastica*.

Petrognatha gigas Fabricius var. *spinosa*; West and East Africa; attacks *Ficus* spp.

Rosenbergia megacephala; Australia; bores in fig trees.

Curculionidæ.

Curculio amœnus Fabricius (*Balaninus*); Australia; breeds in the fruit of *Ficus rubiginosa*.

Alcides scenicus Faust; India; in *Ficus elastica*.

Scolytidæ.

Diamerus fici Blandford; India; attacks nursery stock of *Ficus elastica*.

Hypoborus ficus Erichson; Europe; galleries in bark of figs.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann; attacks fruit of *Ficus carica*. (See Fruit.)

LEPIDOPTERA.

Bombycidæ.

Gunda sikkima; India; attacks foliage of *Ficus elastica*.

Ocinara dilectula Walker and *O. signifera* Walker; Java; attack foliage of *Ficus bergmanniana* and *F. elastica*.

LITERATURE.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

STEBBING, E. P. A Manual of Forest Zoology for India, 1908.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

FIR.

(*Picea* spp., *Abies* spp. Family Pinaceæ.)

Tall, pyramidal, evergreen trees growing in the northern and mountainous regions of the northern hemisphere. The wood is soft and perishable, but valuable products, such as balsam, are obtained from the exudations. For convenience the insect pests are arranged under Conifers.

FLAX.

(*Linum usitatissimum*. Family Linaceæ.)

A plant of Europe and America cultivated for its oil-bearing seed and fibrous stem.

Phalonia epillinana Zell. (Conchylis.)

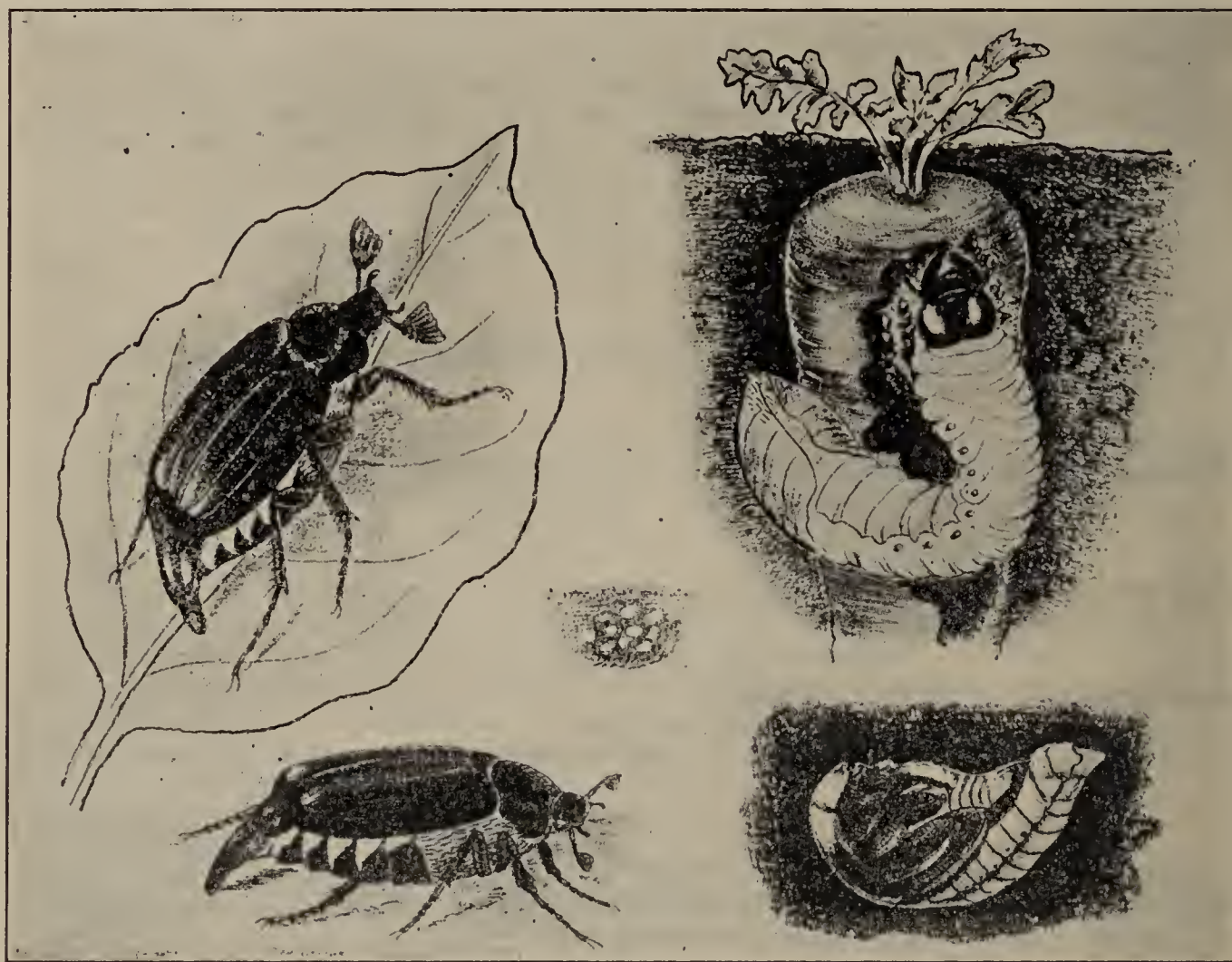
(Flax Capsule Worm. Family Tortricidæ; Lepidoptera.)

Hosts: Flax (*Linum*), *Solidago*, etc.*Injury:* Eats out the green capsules of flax.*Description and biology:* *Moth* with forewings clay yellow with darker band and margin. *Larva* whitish yellow, sparsely pubescent, head and thoracic shield blackish; 6.5 mm. long. *Pupates* in the larval burrow.*Distribution:* South Russia.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 292.

FORESTS.**BETTER KNOWN GENERAL DEFOLIATORS.**

Under this heading are grouped a number of important insects known as forest defoliators. Several of these have been imported into the United States.

FIG. 54.—Cockchafer (*Melolontha vulgaris*); Adult, pupa, larva and its attack on root crop. (Lorenz.)*Melolontha vulgaris* Linn.

(Cockchafer. Family Scarabæidæ; Coleoptera.)

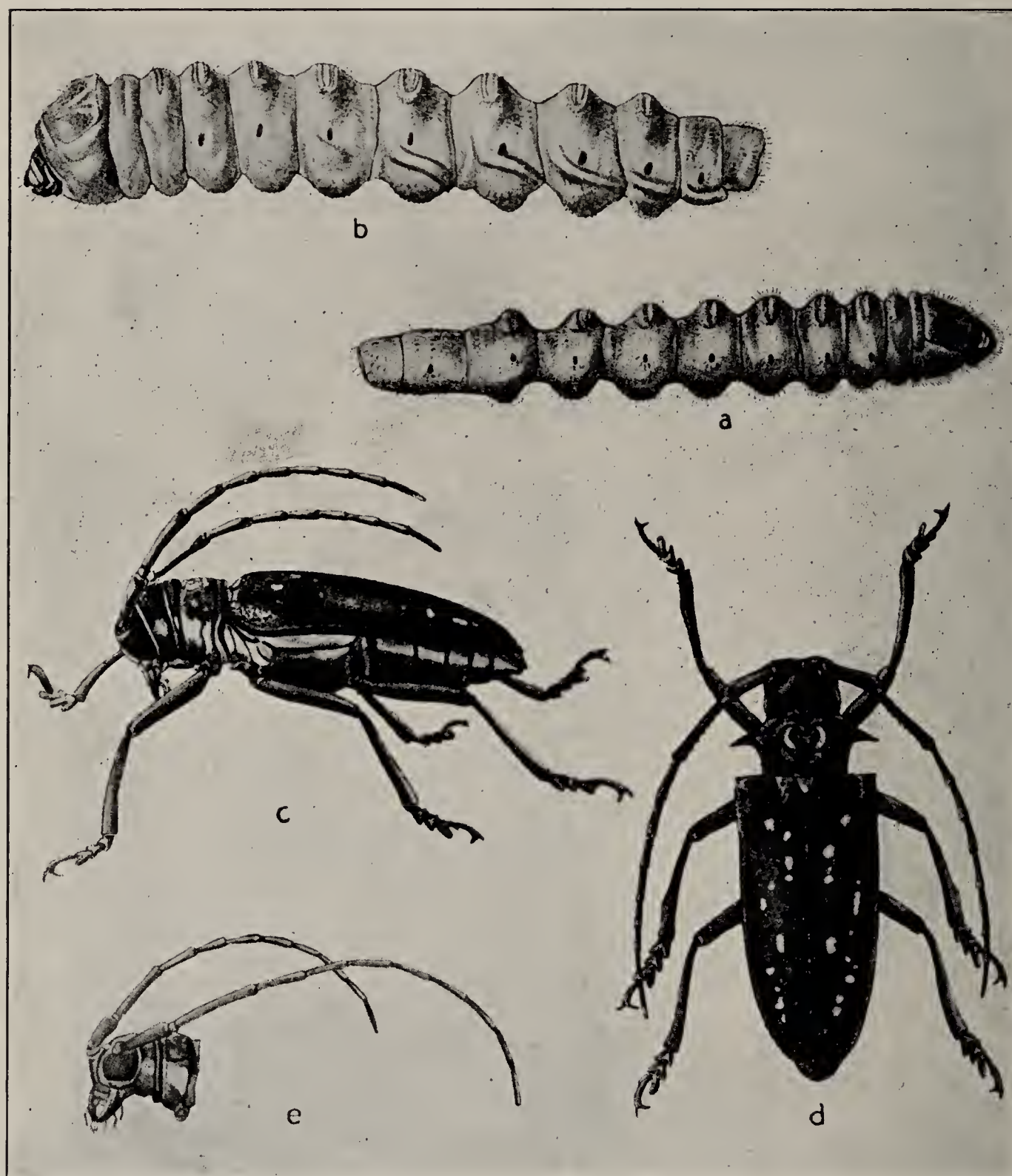
Hosts: Adults feed on leaves of various trees; grubs on roots.*Injury:* Often serious.*Description and biology:* *Adult*, length often 25 mm.; head and thorax black; elytra brown, each with four raised, longitudinal lines; hairy; sides of body with alternate black and white patches; occurs in May and June. *Pupa* pale brown. This stage is passed deep in ground. *Larva*, length 37 mm., white, fleshy; caudal end swollen; head and legs brown. This stage lasts three years. *Eggs*, large, shape of hemp seed, creamy white (see text fig. 54).*Distribution:* Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 431.



A FIG-BORER.

Fig-borer (*Hylesinus porcatus*): Adult and injury. (Froggatt.)



A FIG BORER.

Fig-borer (*Batocera rubra*): Adults and larvæ. (Stebbing.)

Anisopteryx æscularia Schiffermiller.

(March Moth. Geometridæ; Lepidoptera.)

Hosts: Whitethorn, blackthorn, apple, plum, pear, oak, linden, elm, maple, walnut and chestnut.

Injury: Occasionally serious pest. Defoliation.

Description and biology: *Adult male*, wing expanse 30–37 mm.; forewings grayish brown, with dark and pale transverse lines, small brown spot near upper border of each wing; hind wings pale gray, dark line more or less continued from outer line on each forewing; *female*, wingless, grayish to grayish brown, with fan-like tail of hairs. Appears from February to April (England). *Pupates* in ground. *Larva*, length 25 mm.; bright green, or green tinged with yellow; on back, a narrow dark-green line edged with creamy white or gray; on each side three pale lines; head uniformly green; matures by end of June. *Eggs* deposited in a partial band of 50 to 200 around twig; covered with hairs; hatch in April. (See text fig. 55.)

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 61.

Cheimatobia brumata Linnaeus.

(Winter Moth. Geometridæ; Lepidoptera.)

Hosts: Fruit and forest trees (except conifers) and shrubs.

Injury: One of the most harmful and widespread of fruit-tree pests. Defoliation. Also attacks fruit and flowers.

Description and biology: *Adult male*, wing expanse 30 mm.; forewings grayish brown to brown, marked with darker transverse wavy lines; hind wings of paler uniform color; *female* practically wingless, having very short, useless, vestigial wings, gray to grayish brown in color. Moths appear from October to middle of



FIG. 55.—The March moth (*Anisopteryx æscularia*): a, Adult male; b, eggs on twig; c, d, female moths. (Theobald.)



FIG. 56.—The winter moth (*Cheimatobia brumata*): Adult, larva, pupa, egg. (Lorenz.)

January (England). *Larva*, length 30 mm.; pale, yellowish or dark green, with pale lines along the sides of body; in June drops to ground to form pupal cell. *Eggs* deposited on twigs, small branches, etc.; slightly elongate and truncated at ends; at first yellowish green, later brick red. (See text fig. 56.)

Distribution: Europe, Greenland.

THEOBALD, F. V. Insects Pests of Fruit, 1909, p. 50.

***Hibernia defoliaria* Clerck.**

(Mottled Umber Moth. Geometridæ; Lepidoptera.)

Hosts: Apple and other fruits; forest trees.*Injury:* Great damage done occasionally by defoliation; sometimes attacks fruit.

Description and biology: Adult male, wing expanse 44 mm.; forewings normally pale dull yellowish, mottled with yellowish brown and dusted with brown; hind wings more uniform yellowish gray, with minute darker specks and a dark spot on each (color variable; many melanistic forms); female, wingless, plump, of various shades of yellowish gray and speckled with dark brown or black. Appears from October to February (England). Pupates in soil. Larva length 37 mm.; chestnut brown above; sides pale creamy yellow to bright yellow; venter pale yellow; spiracles pale with dark rims. Eggs deposited on buds and twigs, in dark crevices and on pruned surfaces, hatching in April. (See text fig. 57.)

Distribution: Europe.

FIG. 57.—Mottled umber moth (*Hibernaria defoliaria*):
Adult, larva, egg masses. (Sorauer.)

THEOBALD, F. V. Insect Pests of
Fruit, 1909, p. 58.

***Malacosoma neustria* Linnæus.**

(Lackey Moth. Lasiocampidæ; Lepidoptera.)

Hosts: Fruit trees, oak, elm, hawthorn, rose, poplar, hornbeam.*Injury:* Strips trees of foliage.

Description and biology: Adult male, wing expanse 25 mm., female 30–35 mm. Front wings reddish brown, ochreous or brick red with two transverse lines, pale or dusky; hind wings paler than front wings. Moth flies in July and August. (England.) Cocoon pale white or yellow, loose, of silk mixed with hairs. Pupa dark brown, stage lasting 2 or 3 weeks. Larva about 37 mm. long, bluish-gray in color with a pure white dorsal stripe; three orange red stripes along each side and between the two lowest of these a broad blue stripe with little black specks on it. These lines are separated by black, and black spotted with blue; a narrow dark line is on each side of the dorsal white stripe and two black spots on head and on first thoracic segment. The whole larva bears rusty hairs. Larvæ feed under tents in early stages; later they retire to tents only at nights and during dull weather. Eggs are deposited in rings containing from 40 to 200 each, around twigs, and hatch about end of April. (See text fig. 58.)

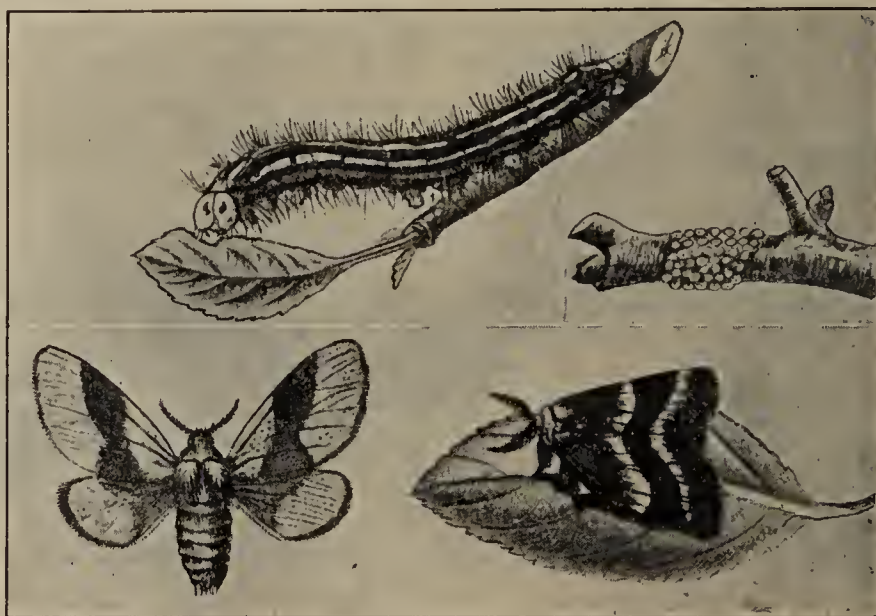


Fig. 58.—Lackey moth (*Malacosoma neustria*): Adults, larva, eggs. (Lorenz.)



DIFFERENT STAGES OF THE BROWN-TAIL MOTH (*EUPROCTIS CHRYSORRHOEA*).

Winter nest at upper left; male and female adults, lower right; cocoon in leaves, upper right; male and female chrysalides above, male at left; full grown larva in center, somewhat reduced; young larvæ at its left; egg mass removed from leaf, showing single eggs at lower left; female ovipositing on leaf; egg mass also on same leaf. (Howard and Fiske.)

Distribution: Europe, except polar region; present also in western Asia, Siberia, China, and Japan.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 30.

MONTILLOT, L. *Les Insectes Nuisibles*, 1891, p. 22.

NÜSSLIN, OTTO. *Leitfaden der Forstinsektenkunde*, 2d ed., 1913, p. 342.

SORAUER, P. *Handbuch der Pflanzenkrankheiten*, 3d ed., 1913, vol. 3, p. 378.

***Dasychira pudibunda* Linnæus.**

(Redtail Moth. *Lymantriidæ*; *Lepidoptera*.)

Hosts: Beech, hornbeam, oak, alder, buckthorn, hawthorn, blackthorn, hazel, rose, birch, elm, linden, maple.

Injury: General defoliator.

Description and biology: *Moth* wing expanse 38–60 mm.; female larger than male; forewings whitish-gray, with two dark cross lines and dark flecked fringe; hind wings dirty gray with washed-out bar; body reddish white or grayish in front, whiter behind. *Larva* 40–45 mm. long, greenish yellow with black cross bars; yellow brushes on fourth to seventh segments; eleventh segment with a red hair pencil. *Larvæ* feed on foliage June to October. Pupate on ground or in brush. *Pupa* brownish black, abdomen reddish brown, clothed with yellow hairs, in silken cocoon. Hibernates as pupa. *Eggs* in clusters of 50 or more on twigs.

Distribution: Europe, China, Japan.

SORAUER, P. *Handbuch der Pflanzenkrankheiten*, 3d ed., 1913, vol. 3, p. 384.

HESS, RICHARD. *Der Forstschutz*, vol. 2, 1900, p. 91–97, fig. 57.

GUÉNAUX, G. *Entomologie et Parasitologie Agricoles*, 1904, p. 392.

HENSCHEL, G. A. O. *Die schädlichen Forst- und Obstbaum-Insekten*, 1895, p. 329.

* ***Euproctis chrysorrhoea* Linnæus.**

(Brown-tail Moth. *Lymantriidæ*; *Lepidoptera*.)

Hosts: Beech, elm, hornbeam, maple, oak, poplar, blackthorn, hawthorn, rose, willow.

Injury: General defoliator; very serious.

Description and injury: *Moth*, white, posterior part of body reddish brown; wing expanse 30–35 mm. *Larvæ* 30–38 mm. long, brownish gray, with light brown hairs. The *larvæ* feed on foliage under heavy white webs. (See plate xxii.)

Distribution: Palæarctic regions (Europe, Asia). Has been introduced into the northeastern United States.

ANNUAL REPORTS STATE FORESTER OF MASSACHUSETTS.

* ***Porthetria dispar* Linnæus (*Lymantria*).**

(Gipsy Moth. *Lymantriidæ*; *Lepidoptera*.)

Hosts: Beech, elm, hornbeam, linden, maple, oak, poplar, willow, alder, birch.

Injury: General defoliator. Easily transported in egg stage on bark of nursery stock. A very serious pest.

Description and biology: *Male*, moth 35–50 mm.; forewings gray brown with dark brown, strongly notched transverse stripes and dark flecks on fringe; hind wings brown, with dark border and light fringe. *Female*, moth 37–62 mm., wings white with dark fringe spots; the dark transverse stripes in outer part of forewings often disappearing. *Larva* with large head; brown, hairy; three fine yellow longitudinal lines; the first five segments with two blue warts each and on the remaining segments two red warts each; length 7 cm. (See Frontispiece.)

Distribution: Europe, Asia, New England States.

SORAUER, P. *Handbuch der Pflanzenkrankheiten*, 3d ed., 1913, vol. 3, pp. 380–382.

FORBUSH, E. H., and FERNALD, C. H. *The Gypsy Moth*, Mass., St. Bd. Agric., 1896, 495 pp.

* *Lymantria monacha* Linnæus.(Nun Moth. *Lymantriidæ*; *Lepidoptera*.)

Hosts: Beech, birch, elm, poplar, oak, maple, linden, hazel, willow, pine, spruce, mountain ash, buckthorn, bunch cherry, spindle tree, hornbeam, larch, white spruce.

Injury: Attacks the foliage of many trees and is sometimes very serious. As the eggs are said to be laid under the bark, it is very likely to be shipped in nursery stock.

Description and biology: *Moth*, with forewings white, with strong notched black lines; hind wings grayish white; fringe flecked with black; abdomen reddish with black bands. *Larvæ* brown with six blue and red warts on dorsum; on second segment a black, blue, and white spot; three last segments flecked with black; 4–5 cm. long. The species is quite variable in color. The larva is polyphagous, attacking foliage; the larvæ are gregarious and feed within a web.

Distribution: Europe. Specimens were collected at Brooklyn, N. Y., in 1902.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 379–380.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 346–368, figs. 291–298.

Porthesia similis Fuessly.(The Swan Moth. *Lymantriidæ*; *Lepidoptera*.)

Hosts: Beech, birch, elm, hornbeam, linden, mountain ash, maple, oak, willow, rose.

Injury: General defoliator. Liable to importation in the larval stage on the bark of nursery stock.

Description and biology: *Moth*, white with a few black spots on inner margin of forewing; abdomen clad with golden yellow hairs. *Larva* black, clothed with grayish-black hairs. The larvæ feed singly on foliage and hibernate singly under bark, etc. The eggs are laid in a mass on undersides of leaves and covered with yellow hairs from the moth. *Pupation* occurs in a thin white silken cocoon.

HESS, RICHARD. Der Forstschutz, vol. 2, 1900, pp. 102, 103.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 382.

Phalera bucephala Linnæus.(Buff Tip Moth; Moon Spot Moth. *Notodontidæ*; *Lepidoptera*.)

Hosts: Deciduous fruits; cobs, filberts, nuts, birch, beech, elm, rose, poplar, willow, linden, oak, alder.

Injury: Defoliates plants when abundant.

Description and biology: *Adult*, wing expanse 62–70 mm.; forewings ash gray with a transverse streak of reddish brown near base and another of dark brown near apex of wing, marked at tip with a large pale buff or ochraceous lunular spot. *Larva* about 50 mm. long when grown; the ground color dark yellow, with a broad dark stripe down the back; along each side are three black lines interrupted with yellow or orange rings. *Eggs* very convex, flat beneath, pearly white, with a basal green band and dark spot on apex. The insect spends the winter as a pupa in the soil, moths appearing in spring, ovipositing on undersurface of twigs or on foliage.

Distribution: Europe, except Polar region, Siberia, etc.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 292.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 387, fig. 245.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 1913, 2d ed., 1913, pp. 323, 324, fig. 276.

FRUITS.**BETTER KNOWN GENERAL FRUIT-TREE INSECTS.**

Under this heading are grouped a number of very important insects which attack many different kinds of fruits, especially the fruit flies.

Aleurodicus coccolis Curtis.

(Coconut White Fly. Aleyrodidae; Hemiptera.)

Host: Coconut, banana, guava, "jicaco," *Coccoloba uvifera*.*Injury*: Serious pest in many parts of tropical America.*Description and biology*: *Adult* varying in size and wing markings, wings marked with two dusky patches; pupal case varies in size and is surrounded by a double row of bristlelike hairs usually 13 to a side, also has one pair of long caudal hairs. *Egg* about 0.29 mm. long and 0.11 mm. wide, with pedicel arising from side.*Distribution*: Barbados, Trinidad, Venezuela, Brazil, Mexico, Isthmian Canal Zone, Yucatan.

BALLOU, H. A. Insect Pests of the Lesser Antilles, 1912, p. 105.

Nysius vinitor Bergroth.

(The Rutherglen Bug. Lygaeidae; Hemiptera.)

Hosts: Grapes, cherries, plums, peach, grasses, etc.*Injury*: Stated to be one of the most destructive plant bugs in Australia.*Description and biology*: *Adult* 4-5 mm. long; dull brown to gray in color, with silvery-gray wings; antennae barely two-thirds length of body and covered with hairs. Breeds in grass lands and swarms over field crops and fruit trees in countless millions.*Distribution*: Australia. (See plate xxiii.)

FRENCH, C. Handbook of Destructive Insects of Victoria, 1891, pt. 1, p. 105.

FROGGATT, W. W. Australian Insects, 1907, p. 334.

* **Heliothrips rubroclinctus** Giard.

(The Red-Banded Thrips. Thysanoptera.)

Hosts: Avocado (*Persea gratissima*), mango (*Mangifera indica*), cashew, guava (*Psidium guajava*), cacao (*Theobroma cacao*), Liberian coffee (*Coffea liberica*), wild guava (*Anacardium occidentale*), roses, Mexican almond or umbrella tree (*Terminalia catappa*), kola (*Sterculia acuminata*).*Injury*: Larvæ and adults feed on both surfaces of foliage. May be introduced on living plants.*Description and biology*: *Egg* stage varies from 6 to 17 days, larval stage from 6 to 20 days. *Adult* female about 1.11 mm. long and quite stout, color dark brown or black. A red band is evident in the first and second larval stages, pupa and prepupa. (See pl. x.)*Distribution*: Guadeloupe, French West Indies; Grenada, St. Vincent, St. Lucia, British West Indies; Trinidad, Tobago, Virgin Islands, Mauritius, Ceylon, Uganda. In addition to the above it is reported from Florida and was doubtless introduced.

RUSSELL, H. M. U. S. Dept. Agr., Bur. Entom. Bull. 99, pt. 2, 1912.

Phyllopertha horticola Linnæus.

(Scarabæidae; Coleoptera.)

Hosts: Fruit trees and herbaceous plants.*Injury*: Destroys foliage and roots.*Description and biology*: *Adult* length 8-11 mm.; body depressed, hairy; head and prothorax shining green; elytra golden brown or chestnut; ventral parts black. Appears in May and June (Italy). Feeds on leaves. The *larva* is a root feeder. Silvestri states that the adults and larvæ of this insect feed on leaves and roots of fruit trees and herbaceous plants.*Distribution*: Europe.

SILVESTRI, F. Dispense di Entomologie Agraria, 1911, p. 311.

Capnodis tenebrionis Linnæus.

(Buprestidæ; Coleoptera.)

Hosts: Various fruit trees.*Injury:* To leaves and roots.

Description and biology: *Adult* length 15–22 mm.; color opaque black, with prothorax sparsely dusted with cinereous; feeds on leaves. *Larva* elongate, whitish, covered with a fine pubescence; feeds in roots and trunk beneath cortex. *Eggs* deposited during August and September on crown of trees. (See text fig. 59.)

Distribution: Southern Europe.

SILVESTRI, F. Dispense di Entomologie Agraria, 1911, p. 335.



FIG. 59.—Fruit tree borer (*Capnodis tenebrionis*):
Adult, larva. (Silvestri.)

lowish. Occurs throughout May and June. *Pupates* in spring in earth. *Larva* a white footless grub, slightly hairy; head brown. Winters as larva. *Eggs* are deposited in ground.

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruits, 1909, p. 119.

Biston hirtarius Clerck.

(Cherry Spinner. Geometridæ; Lepidoptera.)

Hosts: Stone fruits, orchard trees.*Injury:* Defoliation.

Description and biology: *Adult* in both sexes winged; whitish, dusted with blackish gray and obliquely marked with blackish brown. Occurs in March and April (Germany). *Pupates* in the earth. *Larva*, length 35 mm.; ash gray or brown in color, with longitudinal dark lines; prothorax, tubercles and two spots on each segment yellow; occurs from May until September. (See text fig. 60.)

Distribution: Germany, northern Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 339.

Biston pomonarius Hübner.

(Geometridæ; Lepidoptera.)

Hosts: Fruit trees and oaks.*Injury:* Defoliation.

Description and biology: *Adult*, male wings grayish white, on border blackish, dusted with gold, with dark oblique lines; female, with wing stumps black, sprinkled with

red and with gray and white hairs. Occurs in April and May (Germany). *Pupates* in the earth. *Larva*, length 40 mm.; gray, with golden, longitudinal lines; occurs May to July.

Distribution: Northern Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 339.

***Hibernia rupicaprararia* Hübner.**

(Early Moth. Geometridæ; Lepidoptera.)

Hosts: Plum, thorns, fruit trees.

Injury: "No record of serious damage." (Theobald.)

Description and biology: *Adult* male wing expanse 30 mm.; forewings gray brown, with broad dark area across middle, edges dark and notched; hind wings whitish gray, with a dark central spot above middle and crossed by an indistinct gray streak; female, almost wingless, stumps of wings grayish; occurs in January and February

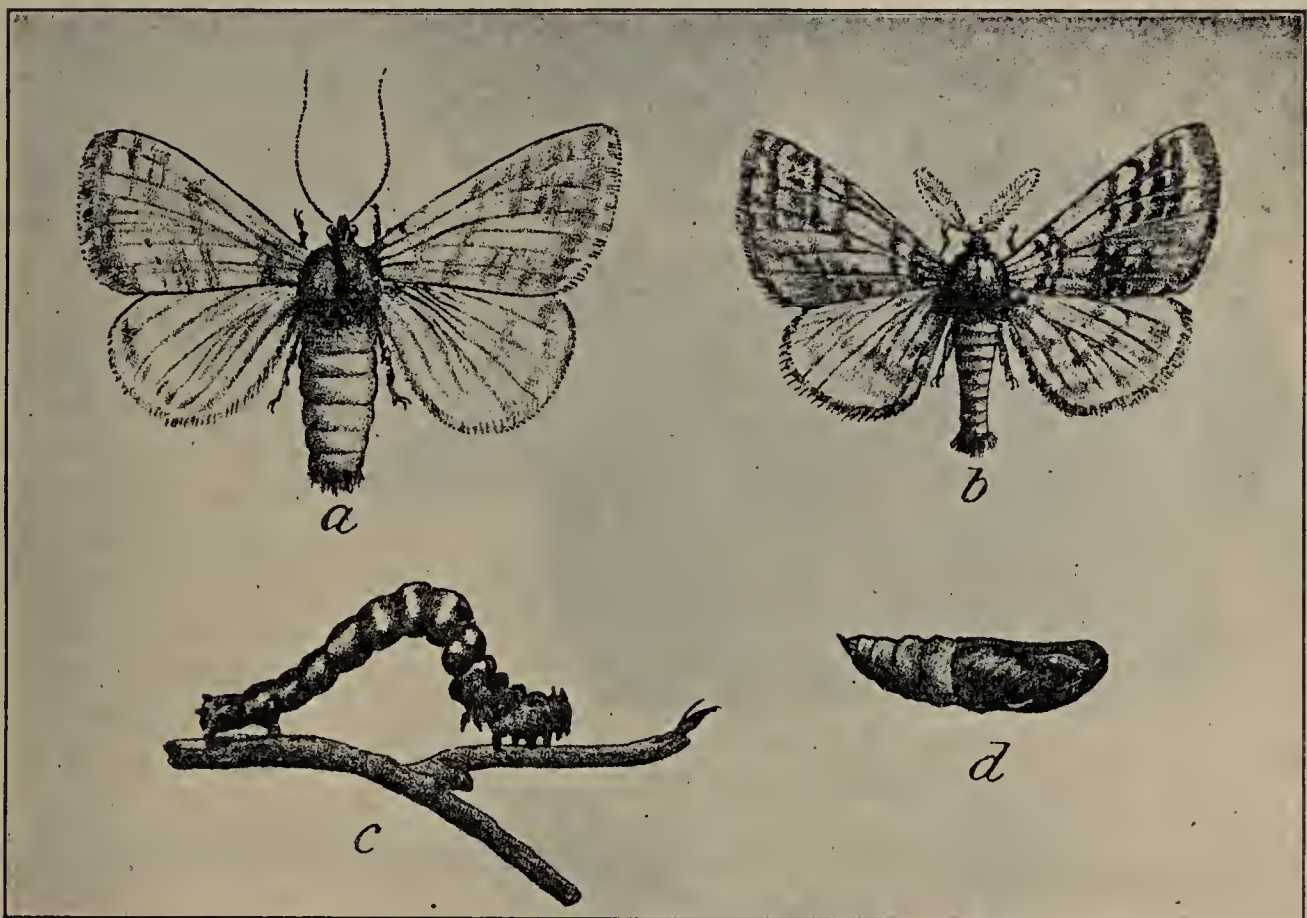


FIG. 60.—Cherry spinner (*Biston hirtarius*): *a*, Adult; female; *b*, adult male; *c*, larva; *d*, pupa. (Sorauer.)

(England). *Larva* bluish green with pale green back, front of each segment darkened, and a white line on each side; *pupates* in soil.

Distribution: England, Europe (except Russia), Asia Minor.

THEOBALD, F. V. Insect Pests of Fruits, 1909, p. 362.

***Gastropacha quercifolia* Linnæus.**

(Lappet Moth. Lasiocampidæ; Lepidoptera.)

Hosts: Apple, plum, pear, hawthorn, blackthorn, willow, willow, willow, willow.

Injury: Can not be looked upon as a pest. Sometimes strips branches and shoots.

Description and biology: *Adult* male wing expanse 56 mm.; female, 80 mm.; color rich brown, with dark irregular, transverse, scalloped lines on both pairs of wings, edges of wings scalloped. Moths appear in June and July (England). *Pupa* large brown motile; cocoon spun among twigs of trees, crevices, in bark and rubbish on ground; oval, pointed at one end and mouse-colored. *Larva* 100 mm. long; gray and gray brown, with faint V-shaped dark marks dorsally; two deep blue or purple bands

across first thoracic segment; above legs on each side is a row of fleshy pad-like appendages with long gray hairs like "lappets"; body finely hairy. Larvæ appear in autumn and hibernate, extended on twigs.

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruits, 1909, p. 19.

Odonestis pruni Linnæus.

(Lasiocampidæ; Lepidoptera.)

Hosts: Various fruit trees.

Injury: Defoliation.

Description and biology: Adult length of wing 20–30 mm.; forewing orange, strongly dusted with red, with sharp points and a notched margin; a single white spot in the



FIG. 61.—The Amar caterpillar (*Virachola insocrates*): Adult and larva. (Maxwell-Lefroy.)

middle; front diagonal lines arched, hind diagonal line straight, body and hindwing brick red. Occurs June and July (Germany); pupates in May (Germany) in grayish-white cocoon. Larva length 65–70 mm.; blue gray, with golden longitudinal lines, and dull golden-gray spots; head brownish gray; hatches in August; overwinters and feeds in spring until May (Germany). Eggs deposited singly.

Distribution: Europe.

HENSCHEL, G. A. O. Die Schädlichen Forst und Obstbaum-Insekten, 1895, p. 315.

Virachola insocrates Fabricius.

(The Amar Caterpillar. Lycænidæ; Lepidoptera.)

Hosts: Pomegranate, guava, loquat, and wild fruit.

Injury: Larvæ occasion considerable injury by feeding in the fruit.

Biology: Eggs deposited singly on flowers; caterpillar on hatching bores into the fruit, feeding on the hard seed; pupates over the base of fruit. (See text fig. 61.)

Distribution: India.

MAXWELL-LEFROY, H. Indian Insect Pests, 1906, p. 179.

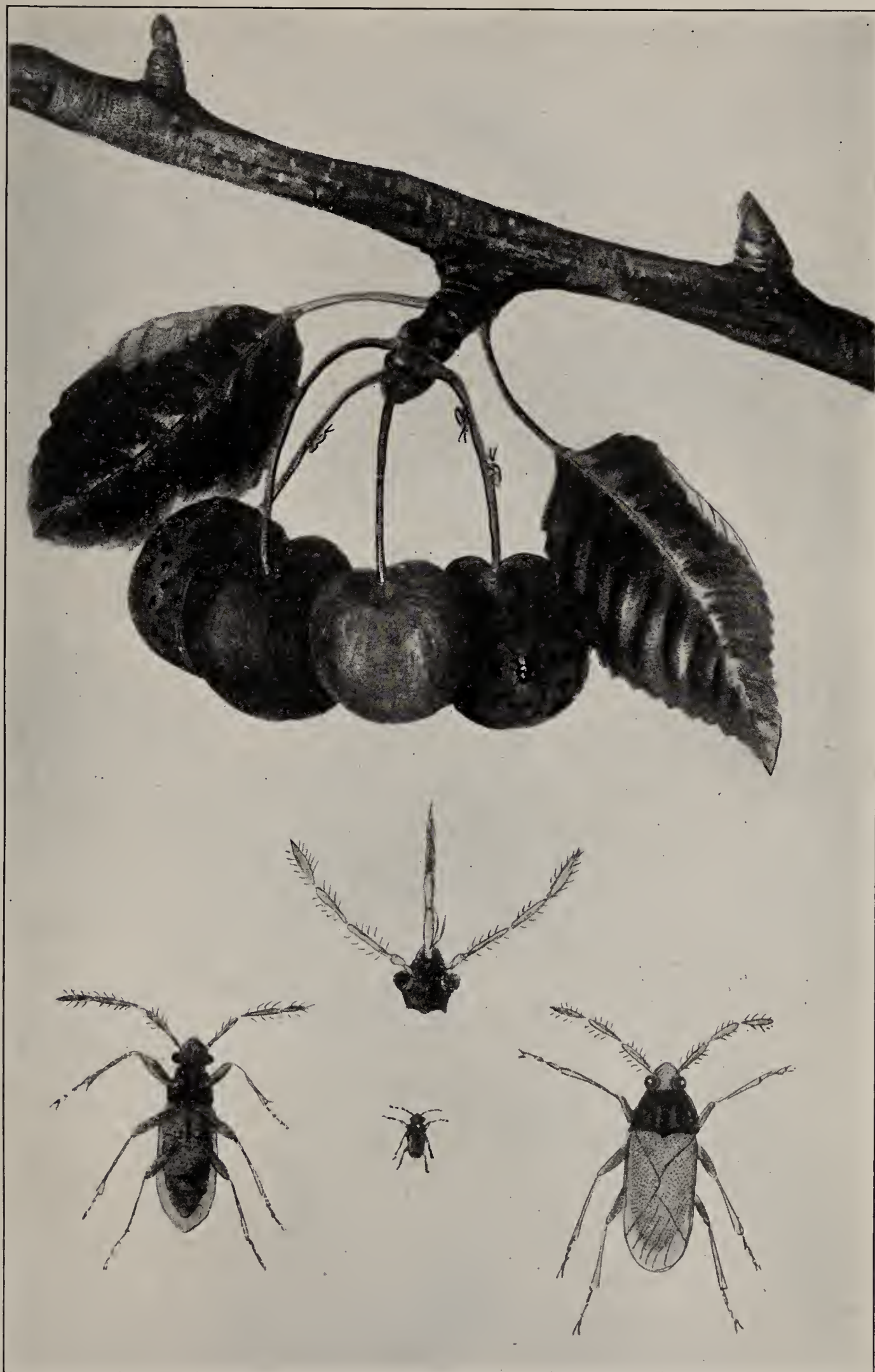
Orgyia gonostigma Fabricius.

(Brush Spinner; Corner spot. Lymantriidæ; Lepidoptera.)

Hosts: Orchard and other trees.

Injury: Defoliation.

Description and biology: Adult male, forewing 13–15 mm.; olive brown with white spots, on the front and inner margins toward the base long orange wavy lines, basal portion, and a spot on the oblique vein, purple brown, fringe between veins black spotted; hind wing brownish black. First generation June and July, second, September (Germany). Pupates between leaves and in crevices. Larva of male, 52 mm.



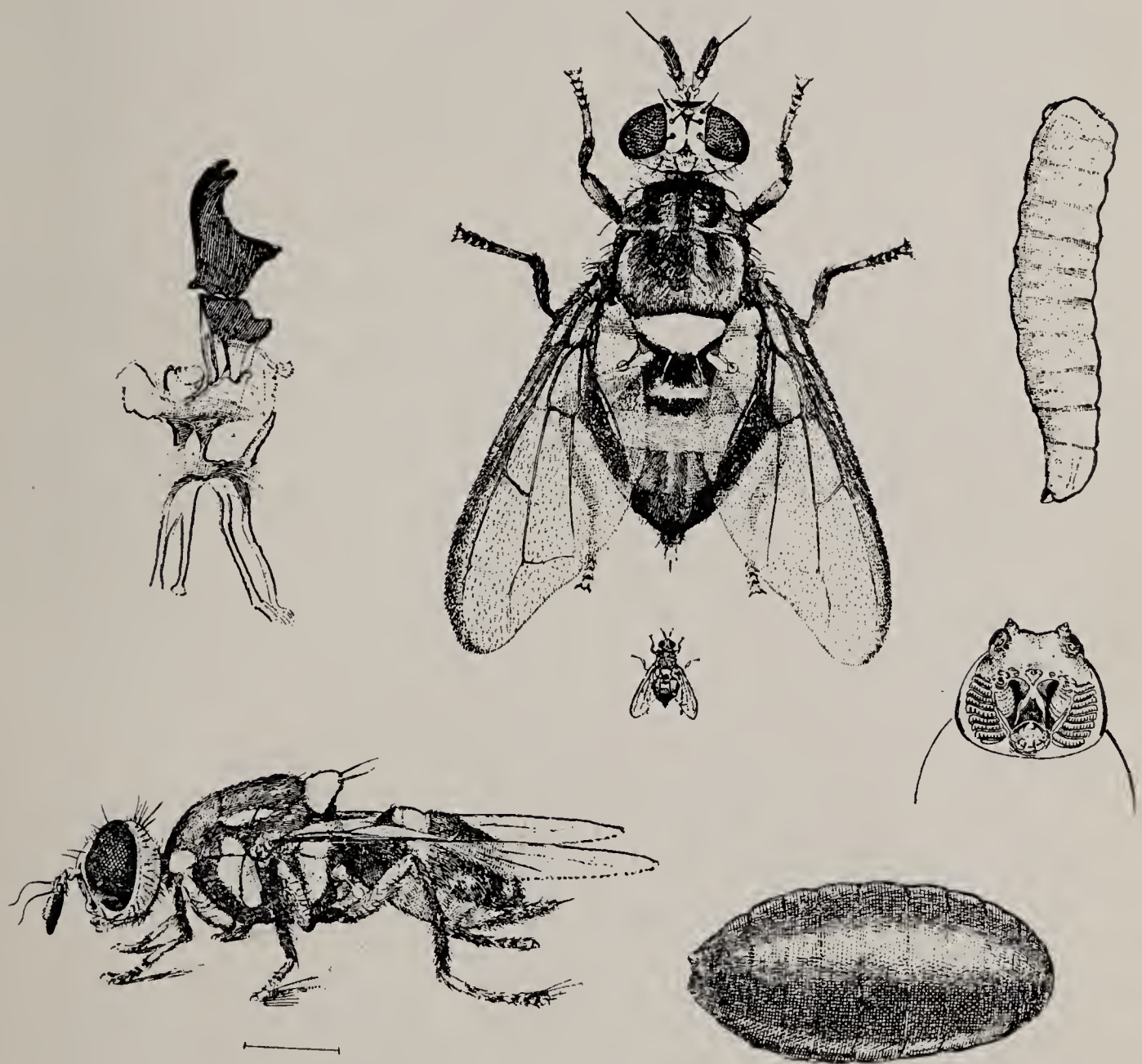
A CHERRY PEST.

The Rutherglen bug (*Nysius vinitor*): Adults and injuries to cherries. (French.)



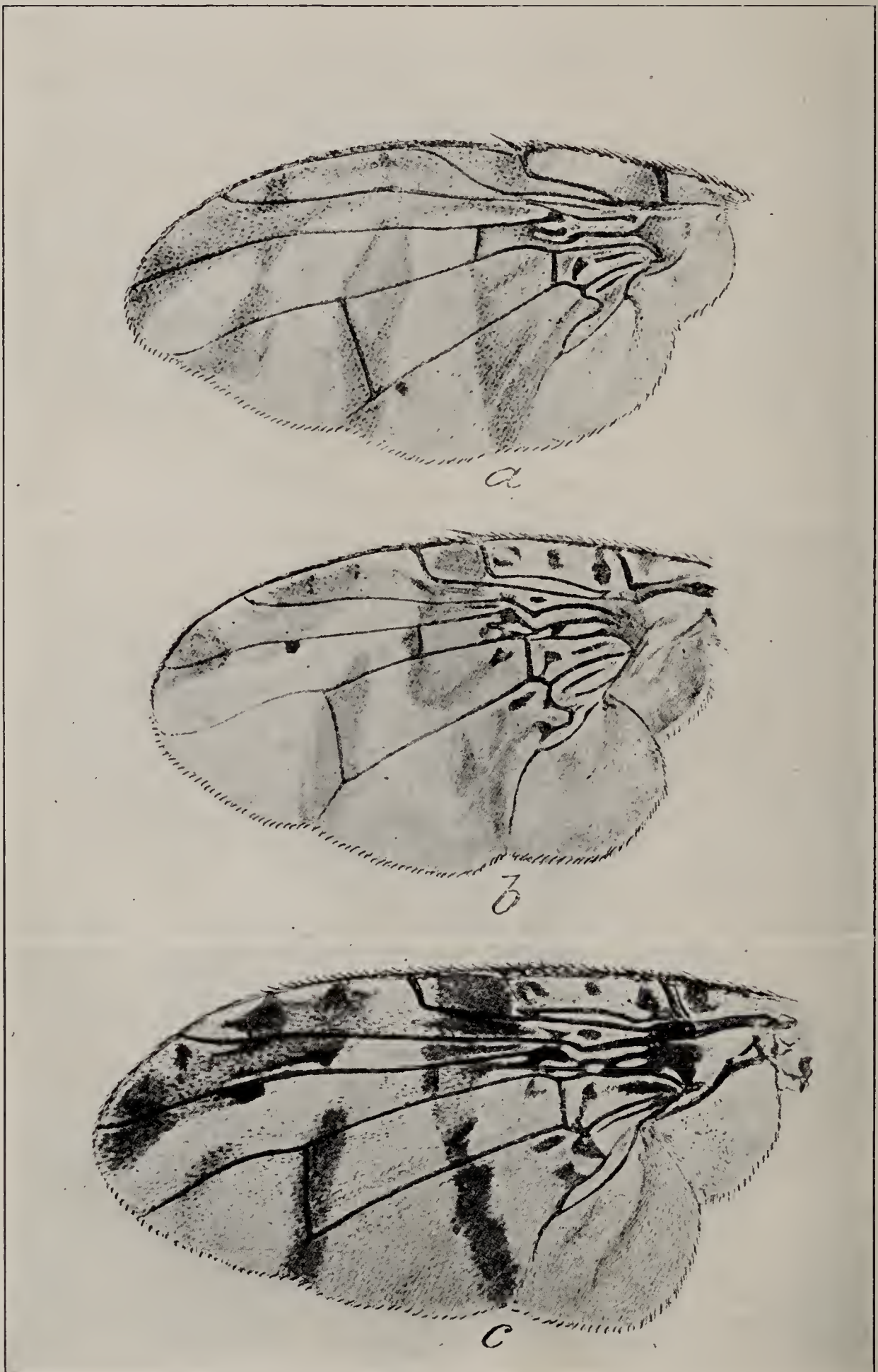
THE PAINTED APPLE MOTH.

The painted apple moth (*Teia anartoides*): Adults, larvæ, pupæ, eggs. (French.)



THE QUEENSLAND FRUIT FLY.

The Queensland fruit fly (*Bactrocera tryoni*): Adults, larva, puparium. (Froggatt.)



WINGS OF FRUIT FLIES.

FIG. a.—*Ceratitis striata*. FIG. b.—*Ceratitis capitata*. FIG. c.—*Ceratitis rubivora*. (Froggatt.)

long, of female 30 mm.; black striped with reddish gold; four pair of dorsal brushes, golden brown; pencils black, adorned with long variable hairs; warts white covered with golden hair; head grayish black with red collar; spring and summer broods. *Eggs* deposited in mass near pupal exuvium; overwinter.

Distribution: Europe.

HENSCHER, G. A. O. Die Schädlichen Forst und Obstbaum-Insekten, 1895, p. 326.

Teia anartoides Walker.

(Painted Apple Moth. Lymantriidæ; Lepidoptera.)

Hosts: Fruits, particularly apple, cherry, rose, acacia. Almost omnivorous.

Injury: One of most injurious caterpillars of New South Wales. Eats upper surface of leaves. "Strips trees." (French.)

Description and biology: *Adult* female, short, rounded, wingless; male, wing expanse 25 mm.; fore wings dark brown marbled with slender lines and black spots; hind wings yellow surrounded with black outer margin; antennæ featherlike. Two broods. *Pupa* in loose brown silken cocoon of flimsy character. Winters as pupa. *Larva*, 44 mm. long, brown, hairy, with tufts of hairs standing out at front and sides of head and stiff brushes of gray hairs along center of back. *Egg*, dull white, hemispherical. Females average 700 eggs, deposited in the cocoon. (See plate xxiv.)

Distribution: New South Wales, Victoria.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1900, pt. 3, p. 94.

Olethreutes cynobatella Linnæus.

(Gray Fruit Tree Bud Moth. Tortricidæ; Lepidoptera.)

Host: Various fruit trees.

Injury: Attacks leaf and blossom buds.

Description and biology: *Adult*, fore wing 7.5–10.5 mm.; from the middle of the front margin to the inner angle dark bluish-gray mixed with brown; behind the middle, two variable, distinct dark spots on an entirely white background; the large apical third white, clouded with gray. On wing, June until August (Germany). *Pupates* in grass or in crumpled leaves, drawn together, during May and June. *Larva*, brownish green; bores in the opening leaf and flower buds, the points of which it spins together; occurs in spring from time of swelling of buds until May (Germany). *Eggs* are deposited singly on buds; overwinter.

Distribution: Germany, Europe.

HENSCHER, G. A. O. Die Schädlichen Forst und Obstbaum-Insekten, 1895, p. 417.

Anastrepha fraterculus Wiedemann (*acidusa* Walker).

(Fruit Fly. Trypetidæ; Diptera.)

Hosts: Guava, (*Psidium guajava*), coffee berries, pear, peach, mango, orange, *Eugenia* spp., *Phylocalyx*, Japanese plum, Japanese persimmon, Para plum (*Spondias* spp.?), *Annona humboldtiana*, jobo amarillo, jobo de la India.

Injury: A very destructive species and likely to be introduced.

Description and biology: *Adult* fly, about 12 mm. in length (the female exclusive of the ovipositor), with a wing expanse slightly over 25 mm. Color of body rust-yellow or brownish yellow, with three sulphur-yellow longitudinal stripes on the thorax in well preserved mature specimens. Wings clear tinted in part with a characteristic pattern of yellow brown, the brown predominating on the basal half and extending obliquely forward, being continued along the anterior margin in a broad streak to the extreme tip of the wing; a clear sinuate basal zone involves the second basal cell, the base of the discal and part of the first basal cell, and is followed by a detached spot

at the costa just beyond the tip of the first vein; on the discal half of the wing there is a brown band in the shape of an inverted V, resting on the posterior margin and extending through the first and second posterior cells; this V-shaped mark may be independent, or its apex may be joined to the other brown zone. There is considerable variation in the wing pattern, both as to intensity of coloring and detail of the pattern. Immature specimens have the brown wing pattern much weaker; newly emerged ones show hardly a trace of it. Female ovipositor stout, shorter than abdomen, tapered regularly toward tip and covered with coarse black hairs; in mature specimens it is subcylindrical, but in specimens not fully hardened it is flattened.

Distribution: Mexico, Central and South America, West Indies.

VON IHERING, H. *Revista Agric.* (Sao Paulo), 1901, vol. 6, No. 70, p. 180. ✓

HOWARD, L. O. *U. S. Dept. Agric., Yearbook* 1897, p. 546. ✓

HOOKER, C. W. *Ann. Rept. Porto Rico Agric. Exp. Sta.*, 1912, p. 36. ✓

***Anastrepha ludens* Loew.**

(Mexican Fruit Fly. Trypetidæ; Diptera.)

Host: Orange, sweet lime, mango, *Sideroxylon* (*Achras*) *sapota*, peach, guava, plum.

Injury: Considered a serious pest in Mexico. Quarantine issued January 15, 1913.

Description and biology: *Adult* female, length 9 mm.; of dull ochreous yellow color; wings hyaline, mottled and striped with brownish yellow bands; anal segment of abdomen longer than remainder of abdominal segments combined. *Eggs* deposited under skin of ripening fruit, larvæ on hatching out tunnel into the fruit; *pupate* in soil. Average life cycle about 3 months, making about four generations a year in Mexico.

Distribution: Mexico.

FROGGATT, W. W. *Department of Agric., New South Wales, Farmers' Bull.* 24, 1909, p. 53.

***Anastrepha peruviana* Townsend.**

(Peruvian Fruit Fly. Trypetidæ; Diptera.)

Hosts: Peach, guava, cherimoya, many other deciduous and citrous fruits.

Injury: Very serious in Peru.

Description: *Female fly*, to tip of ovipositor, 7–8 mm. long; male 6.5–7 mm. long; wing expanse 6–6.5 mm. Color of head, pleuræ, anterior half of venter, and legs watery lemon yellow; antennæ and proboscis buff yellow; tibiæ and tarsi slightly dusky; mesopleural and sternopleural plates largely rufous-yellow tinged; eyes bright green to lilac purple; other parts obscure tawny or yellow.

Distribution: Peru.

TOWNSEND, C. H. T. *Journ. Econ. Entom.*, 1913, vol. 6, No. 4, p. 345.

***Bactrocera tryoni* Froggat.**

(Queensland Fruit Fly. Trypetidæ; Diptera.)

Host: Banana, mango, peach, apricot, nectarine, orange, apple, quince, black apple (*Sideroxylon* [*Achras*] *australe*), cheesewood (*Acronychia lævis*), white ash (*Schizomeria ovata*), cucumbers, loquats.

Description and biology: *Adult* female, 6 mm. long with wing expanse 10–12 mm., wings transparent, abdomen constricted at the base and broadly rounded at the tip, thorax with a broad creamy often pale dorsal band running down the scutellum with short, well-defined narrow pale yellow stripe on each side. (See plate xxv.)

Distribution: India, Ceylon, Java, Amboina, Australia (Queensland, New South Wales).

FROGGATT, W. W. *Dept. Agric., New South Wales, Misl. Pub. No.* 303, 1899, p. 2, ✓
figures.

FROGGATT, W. W. *Dept. of Agric. New South Wales, Farmers' Bul.* 24, 1909, p. 11.

Ceratitls anonæ Graham.

(Annona Fruit Fly. Trypetidæ; Diptera.)

Hosts: Sour sop (*Annona muricata*), guava (*Psidium cattleianum*), and cacao pods.*Injury:* Attacks fruit.*Description:* Adult female, head alutaceous, wings with black spots at the base, abdomen nut brown in color on dorsum, antennæ almost twice as long as wide; length of body 6 mm.*Distribution:* West Africa (Nigeria, Kongo, Ashanti, Armani, German East Africa).

SILVESTRI, F. Boll. Lab. Zool. R. Sc. Agric., Portici, 1913, vol. 8, p. 61. ✓

SILVESTRI, F. Bd. Agric. and Forestry, Terr. Hawaii, Div. Ent., Bul. 3, 1914, p. 66.

Ceratitls capitata Wiedemann.

(The Mediterranean Fruit Fly. Trypetidæ; Diptera.)

Hosts: *Aberia caffra* (kei apple), *Sideroxylon sapota* (sapodilla), *Annona muricata* (sour sop), *Atropa belladonna*, *Averrhoa carambola*, *Calophyllum inophyllum* (round kamani), *Capsicum* sp., *Carica papaya*, *C. quercifolia*, *Carissa arduina* (Natal plum), *Cestrum* sp. (Chinese inkberry), *Chrysobalanus ellipticus*, *C. icaco* (cocoa plum), *Chrysophyllum cainito* (star apple), *Citrus aurantium* (orange and varieties), *C. grandis* (grapefruit), *C. japonica* (kumquat and Chinese orange), *C. limonia* (lemon), *C. nobilis* (mandarin orange), *Coffea arabica* (coffee), *Diospyros kaki* (Japanese persimmon), *Eriobotrya japonica* (loquat), *Eugenia braziliensis* (Brazil cherry), *Eugenia jambos* (rose apple), *E. malaccensis* (mountain or Malay apple), *E. uniflora* (Cayenne or Surinam cherry), *Ficus carica* (fig), *Herpephyllum caffrum* (Kaffir plum), *Lycopersicum esculentum* (tomato), *Mammea americana* (mammee apple), *Mangifera indica* (mango), *Mimusops elengi* (elengi tree), *Murraya exotica* (mock orange), *Musa* spp. (banana), *Noronhia emarginata* (Chinese plum), *Opuntia tuna* (prickly pear), *O. vulgaris* (Barbary fig), *Passiflora quadrangularis* (granadilla), *Persea gratissima* (avocado), *Phaseolus vulgaris* (string beans), *Prunus armeniaca* (apricot), *P. cerasus* (sour cherry), *Amygdalus persicc* (peach), *Psidium cattleianum* (strawberry guava) *P. guajava* (guava), *Pyrus communis* (pear), *Cydonia oblonga* (quince), *Mespilus germanica* (medlar) *Malus malus* (apple), *Solanum capsicastrum* (Jerusalem cherry), *Terminalia catappa* (winged kama'i), *T. chebula*, *Thevetia neriifolia*, *Vitis vinifera* (grapes).

Injury: Very injurious wherever it becomes established.

Description and biology: Egg deposited inside of fruit by female, and requires from 2 to 3 days to hatch; the larva upon hatching feeds on the pulp or inside of the fruit until full grown, requiring from 9 to 12 days, whereupon it leaves the fruit and enters the ground to pupate, which stage ranges from 12 to 20 days. The period required for the various stages is influenced by the season, as indicated by Silvestri, requiring from 21 to 23 days to complete the life cycle in August and from 32 to 35 in October. At Honolulu adults have been kept alive for 10 months and certain individuals have required 90 days for development. (See pl. xxvi, fig. b.)

Distribution: Southern Europe (southern Italy, Sicily, Malta, France, Spain), Azores, Cape Verde Islands, Madeira, Africa (northern Uganda, Delagoa, Transvaal, Cape Colony, Kongo, Nigeria, Dahomey), Brazil, Argentina, Bermuda, Australia, (West Australia, New South Wales, northern Victoria, and Queensland), northern New Zealand, Hawaiian Islands, Jamaica, Cape of Good Hope.

QUAINTANCE, A. L. U. S. Dept. Agr., Bur. Entom. Circ. 160, 1912.

SILVESTRI, F. Bd. Agric. and Forestry, Terr. Hawaii, Div. Entom. Bull. 3.

***Ceratitidis nigerrima* Bezzi.**

(Nigeria Fruit Fly. Trypetidæ; Diptera.)

Hosts: Coffee berries, fruit of wild plant (?), *Eugenia uniflora*.*Injury:* Breeds in fruit.*Description:* Adult female with black polished body, head umber, wings colored with brown, tibiæ and tarsi dirty yellowish white, ovipositor slightly recurved.*Distribution:* Southern Nigeria, Kamerun.

SILVESTRI, F. Bd. Agric. and Forestry, Terr. Hawaii, Div. Entom., Bul. 3, 1914, p. 72.

***Ceratitidis giffardi* Bezzi.**

(Giffard Fruit Fly. Trypetidæ; Diptera.)

Hosts: *Chrysobalanus ellipticus*, *Sarcocephalus esculentus*.*Injury:* Larvæ feed in fruit of *Sarcocephalus* and less so in *Chrysobalanus*.*Description and biology:* Adult female, body ochraceous, thorax marked with black, wings with black lines and markings at base, bearing also yellowish and brown bands. Transformation to the pupa takes place in the soil, requiring from 10 to 12 days before emerging as adult.*Distribution:* Senegal, Dahomey, southern Nigeria.

BEZZI, M. Boll. Lab. Zool. R. Sc. Agr., Portici, vol. 7, 1912, p. 2, fig. 1. ✓

SILVESTRI, F. Bd. Agric. and Forestry, Terr. Hawaii, Div. Entom., Bul. 3, 1914, p. 61.

***Ceratitidis punctata* Wiedemann.**

(The Cacao Fruit Fly. Trypetidæ; Diptera.)

Hosts: Cacao-pods, mango, guava, passion fruit.*Injury:* Breeds in fruit.*Biology:* Eggs deposited under peel of ripening pods. Pupates in soil. Life cycle requires from 77 to 92 days for completion.*Distribution:* Ashanti, West Africa and Uganda, East Africa.

FROGGATT, W. W. Proc. Linn. Soc. New South Wales. 1910, vol. 35, pt. 4, p. 863. ✓

***Ceratitidis rubivora* Coquillett.**

(Natal Fruit Fly. Trypetidæ; Diptera.)

Host: Various cultivated and wild fruits.*Injury:* Considered one of the most important pests in Natal, infesting both native and cultivated fruits.*Description:* Adult female 4-5 mm. long, head yellowish, thorax yellowish brown, abdomen yellowish, ovipositor flattened. Biology similar to that of *C. capitata*. (See plate xxvi, fig. c.)*Distribution:* Natal, Cape Town, South Africa.

FROGGATT, W. W. Dept. Agric. New South Wales, Farmers' Bul. 24, 1909, p. 48.

***Ceratitidis silvestrii* Bezzi.**

(Fruit Fly. Trypetidæ; Diptera.)

Hosts: *Chrysobalanus*, *Butyrospermum parkii*.*Injury:* Breeds in fruit.*Description and biology:* Adult, body clay or leather color, face and occiput whitened, thorax with a few black markings. Biology similar to *C. capitata*.*Distribution:* Senegal, French Sudan.

BEZZI, M. Boll. Lab. Zool. R. Sc. Agr., Portici, vol. 7, 1912. ✓

SILVESTRI, F. Bd. Agric. and Forestry, Terr. Hawaii, Div. Entom., Bul. 3, p. 63.

Dacus diversus Coquillett.

(Three-striped Fruit Fly. Trypetidæ; Diptera.)

Host: Mango, orange, guava, peach.*Injury:* Breeds in fruit.*Description:* *Adult*, 4-5 mm. long; center of thorax marked with a pale yellow line, with darker regular coloration of the abdomen.*Distribution:* Ceylon, India.

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bul. 24, 1909, p. 16.

Dacus ferrugineus Fabricius.

(Mango Fruit Fly. Trypetidæ; Diptera.)

Host: Fruit of mango (*Mangifera indica*), cucurbitaceous fruits?, ak (*Calotropis* sp.), citrus fruit, *Eugenia malaccensis* ("cabuyao").*Injury:* Injurious to over-ripe fruit and commonest species in India and Ceylon.*Description and biology:* *Adult*, medium size, measuring about 5 mm.; color rusty red, with dorsal surface of thorax varying from black to a rusty red; sometimes the abdomen is marked with almost black bands. Larvæ when in fruit small, yellowish, with pointed head and truncate abdomen; pupate in the soil and emerge as adults in about nine days.*Distribution:* India, Java, Ceylon, Amboina, Philippine Islands.

COTES, E. C. Indian Museum Notes, 1896, p. 17. ✓

MAXWELL-LEFROY, H. Mem. Dept. Agric. India, Entom. Ser., vol. 1, 1907, p. 227. ✓

MAXWELL-LEFROY, H. Indian Insect Pests, 1906, p. 170. ✓

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bul. 24, 1909, p. 13.

Dacus frenchii Froggatt.

(Fruit Fly. Trypetidæ; Diptera.)

Host: Fruit of *Artocarpus integrifolius*.*Injury:* Bred from oranges entering Victoria from New Caledonia.*Description:* *Adult*, female about 10 mm. long, with long, rounded body: large hyaline wings with broad costal stripe of light reddish brown; head with large black spot on each side of face and below the base of the antennæ; thorax dull yellowish brown; legs yellow, with tarsi darkest.*Distribution:* New Caledonia, Java.

FROGGATT, W. W. Dept. Agric. New South Wales, Farmers' Bull. 24, 1909, p. 27.

FROGGATT, W. W. Proc. Linn. Soc. New South Wales, 1910, vol. 35, pt. 4, p. 866. ✓

Dacus passifloræ Froggatt.

(The Fiji Fly. Trypetidæ; Diptera.)

Host: Granadilla, mango, shaddock; the orange, lemon, and lime are slightly infested.*Injury:* One of the most abundant fruit flies in Fiji.*Distribution:* Fiji.

FROGGATT, W. W. Proc. Linn. Soc. New South Wales, 1910, vol. 35, pt. 4, p. 870.

Dacus persicæ Rig.

(Peach Fruit Fly. Trypetidæ; Diptera.)

Hosts: Mango and peach.*Injury:* Larvæ injure ripe fruit.*Description and biology:* *Adult*, red brown with black and yellow markings on the body. Eggs usually deposited in wound on skin of fruit; egg stage about 2 or 3 days;

larval stage 10 to 15 days inside fruit, after which it leaves the fruit and enters the ground to pupate; pupal stage about a week.

Distribution: Bhagalpur and Lower Bengal, India.

BASU and DUTT. Crop Pest Handbook for Behar and Orissa, including also Western Bengal, 1913, p. 74. ✓

Dacus psidii Froggatt.

(South Sea Guava Fruit Fly. Trypetidæ; Diptera.)

Host: Guava, granadilla.

Injury: Larvæ feed in fruits.

Description: Adult female, 6 mm. long, wing expanse 10 mm.; head light brown with rich metallic purple eyes, antennæ brownish black, with last joint black; thorax black; abdomen black, elongate, and narrow at base. (See plate xxvii, figs. 1a, 2a, 3a, 4a.)

Distribution: Fiji, New Caledonia.

FROGGATT, W. W. Dept. Agric., New South Wales, Misc. Pub. 303, 1899. ✓

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bul. 24, 1909, p. 19.

Dacus (Tephrites) xanthodes Broun.

(Broun's Fruit Fly. Trypetidæ; Diptera.)

Host: Pineapple, granadilla, guava, mammee apple, shaddock.

Injury: Breeds in fruits.

Description: Adult female, 9 mm. long, wing expanse 15 mm., general color pale ochreous yellow; thorax with faint yellow dorsal stripe, and pale yellowish white stripe margining each side and marking the sides of the scutellum; abdomen elongate and truncate at apex.

Distribution: Fiji. (Bred in New Zealand from fruit imported from Fiji.)

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bul. 24, 1909, p. 25.

Rioxa musæ Froggatt.

(The Island Fruit Fly. Trypetidæ; Diptera.)

Host: Banana, *Sideroxylon (Achras) australe* (black apple).

Injury: Larvæ feed in bruised or blemished fruit.

Description: Adult female, 6 mm. long, wing expanse 12 mm., head small, ochreous, antennæ yellow with long bristle at apex of second joint, thorax brownish yellow, abdomen small, light brown at base, black on apical half, and covered with coarse hairs. (See plate xxviii, figs. 1, 2.)

Distribution: New Hebrides, Queensland, New South Wales.

FROGGATT, W. W. Dept. Agric., New South Wales, Misc. Pub. 303, 1899. ✓

FROGGATT, W. W. Dept. Agric., New South Wales, Farmers' Bul. 24, 1909, p. 54.

GOOSEBERRY; CURRANT.

(*Ribes* spp. Family Saxifragaceæ.)

Shrubs bearing small edible fruits; native to Europe, Asia, North America, and South America.

A. BETTER KNOWN GOOSEBERRY AND CURRANT INSECTS LIKELY TO BE IMPORTED.

Eriophyes ribis Nalepa.

(Currant Gall Mite. Eriophyidæ; Acarina.)

Host: Infests especially the black currant (*Ribes nigrum*), but also *R. rubrum*, and *R. alpinum*. Certain varieties of black currant are preferred, as Baldwin, Black Naples, Black Dutch, and Lee's Prolific.

Injury: Seriously injurious; can be introduced in nursery stock.

Description and biology: Microscopic. *Adult* about 230 microns long by 40 microns wide. Male smaller; color whitish or pale green, semitransparent and shiny. Sub-cylindrical in shape; 60–70 transverse rings furnished with regular series of short projections, best seen on sides. Infests the buds which may contain thousands of mites, causing them to swell, producing so-called "big buds." Such buds, if they open, usually fail to produce fruit of value. (See text fig. 62.)

Distribution: Middle Europe; England.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 230.

SORAUER, P. *Handbuch der Pflanzenkrankheiten*, 3d. ed., 1913, vol. 3, pp. 121–123, figs. 96, 97.

Bryobia ribis Thomas.

(Red Gooseberry Mite. Tetranychidæ; Acarina.)

Hosts: Gooseberries and currants.

Injury: Very serious injury caused by sucking the juices of the plant. Very easy to introduce on nursery stock.

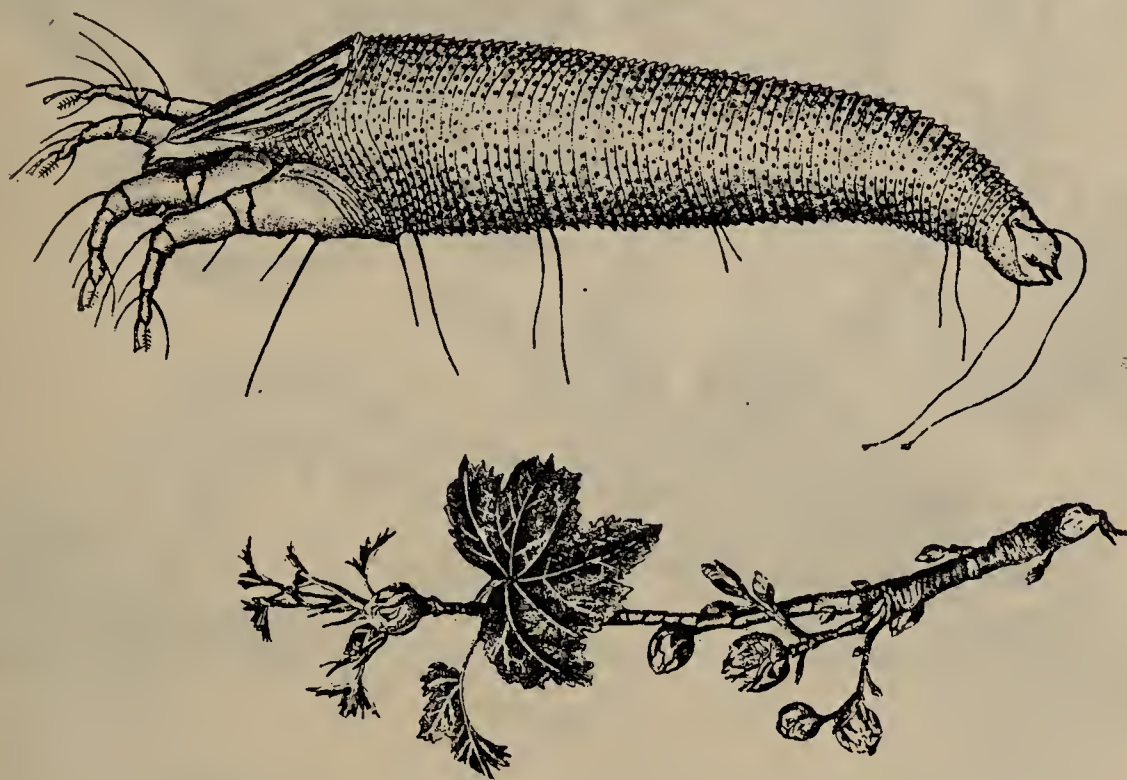


FIG. 62.—Currant gall mite (*Eriophyes ribis*): Mite and galls. (Sorauer.)

Description and biology: This is one of the minute red spiders, having eight legs, which breed on the foliage of plants, causing a rusty appearance. The eggs are spherical and microscopic in size.

Distribution: Germany, England.

SORAUER, P. *Handbuch der Pflanzenkrankheiten*, 3d ed., 1913, vol. 3, pp. 89–91, figs. 67, 68.

Abraxas grossulariata Linnæus.

(Magpie or Currant Moth. Geometridæ; Lepidoptera.)

Host: Currant, gooseberry, and fruit trees.

Injury: Defoliation; seldom seriously injurious.

Description and biology: *Adult* wing expanse 37 mm. (variable); color creamy white, spotted with black, with orange yellow between black spots at base of forewings; hind wings like front, but with no yellow; thorax and abdomen yellow and black. On wing in July and August (England). *Pupa* black, with three golden yellow rings to the body. Cocoon delicate, attached to leaf or twig. *Larva* length 37 mm.;

color creamy white, spotted, and marked with black and orange yellow at sides. Appear in fall; winter as very small larvæ, ready to pupate in June. *Eggs*, cream-colored, laid singly or in groups; hatch in from 6 to 15 days. (See text fig. 63.)

Distribution: England, Europe, Siberia, China.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 206.

***Thamnonoma wauaria* Linnæus.**

(Currant Webworm. Geometridæ; Lepidoptera.)

Hosts: *Ribes* spp.

Injury: Attacks leaves, buds, flowers, and often fruit.

Description and biology: *Adult*, wing expanse 25 mm.; front wing pure gray with brown and black crosslines; hind wing ashen gray dusted with black. Occurs June and July. *Pupates* in or on ground. *Larva*, length 25 mm.; blue green with darker,



FIG. 63.—Currant moth (*Abraxas grossulariata*): Adult, larva, pupa. (Entom. Parasit. Agric. 1904.)

white bordered median line, and a yellow side stripe; on each segment a black tubercle bearing bristles. Shortly before pupation mostly violet or reddish brown.

Distribution: Northern Europe.

SORAUER, P. *Handbuch der Pflanzenkrankheiten*, 3d ed., 1913, vol. 3, p. 336.

* ***Zophodia convolutella* Hübner.**

(Pyralidæ; Lepidoptera.)

Hosts: Gooseberry and currant.

Injury: To fruit and leaves.

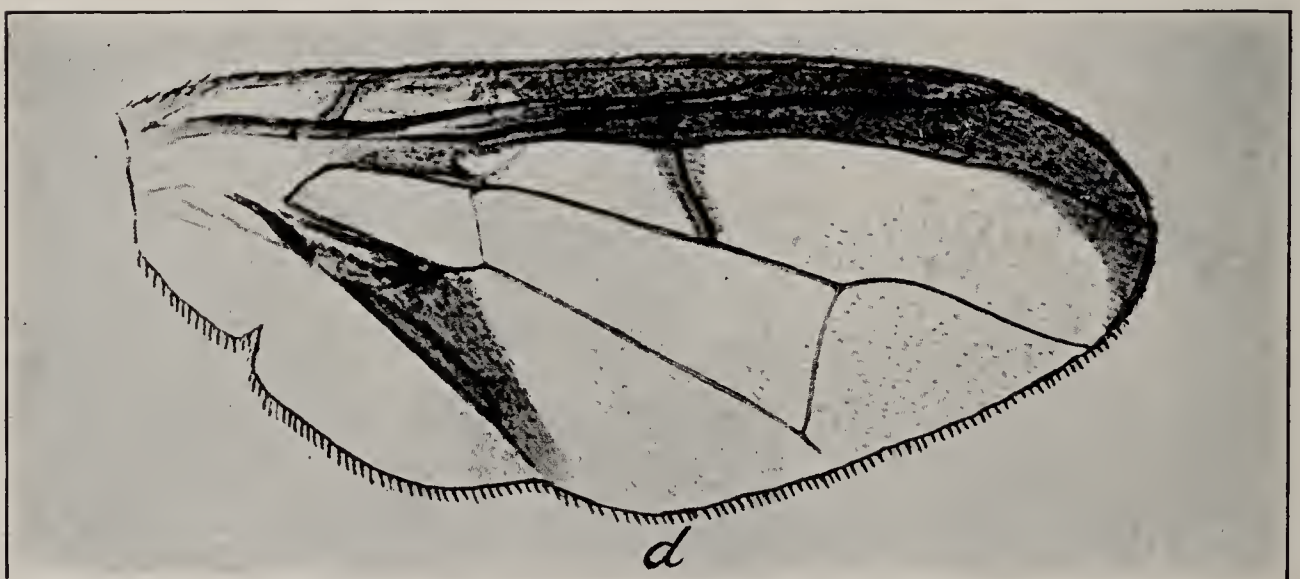
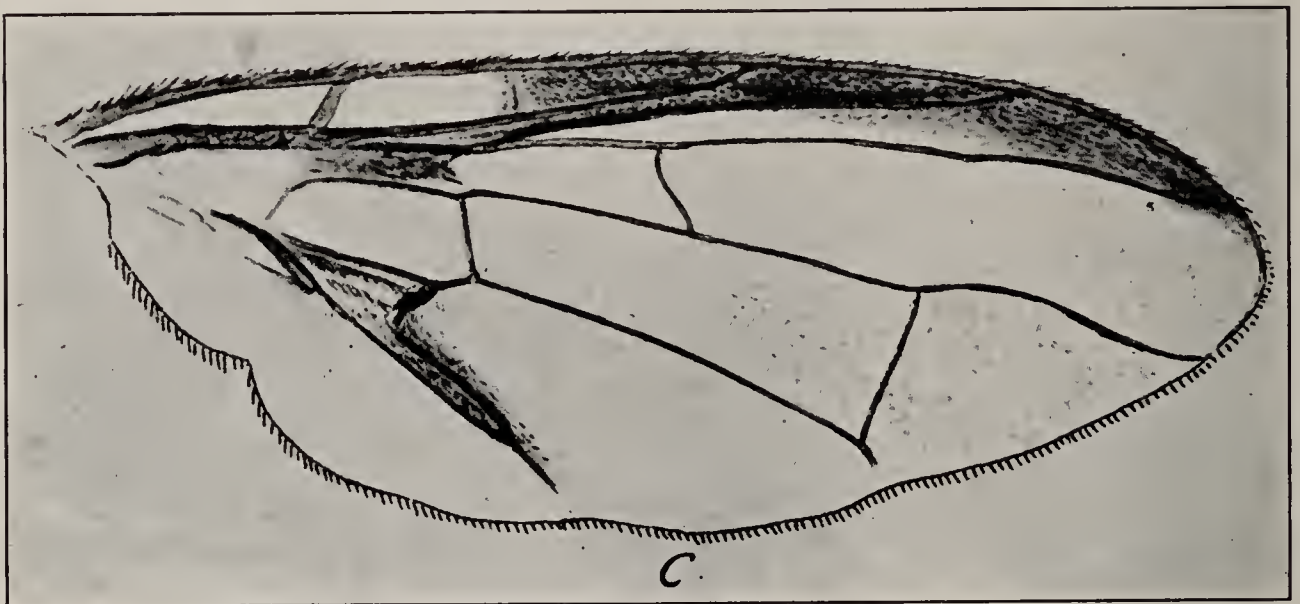
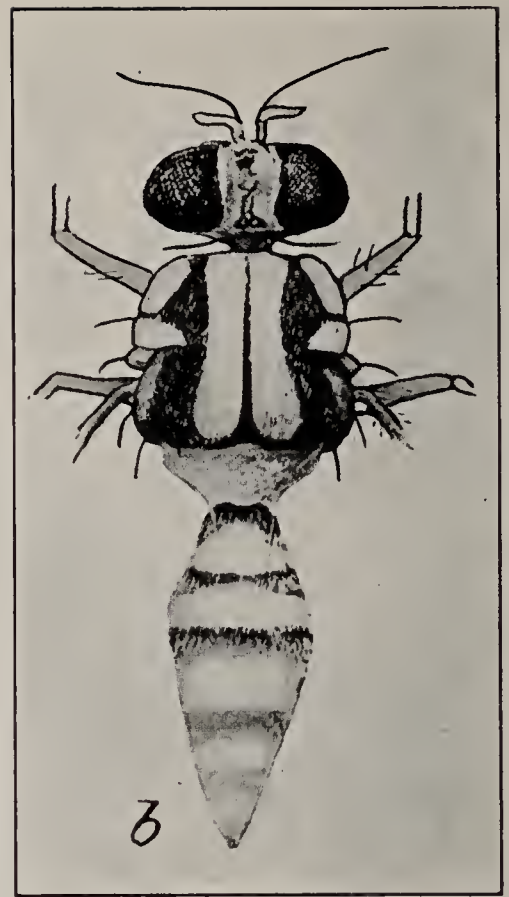
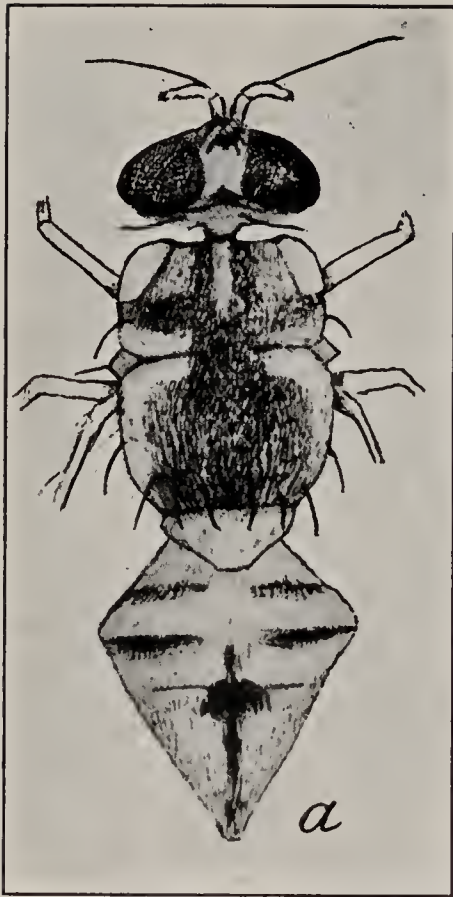
Description and biology: *Adult*, wing expanse 30 mm.; forewing brownish gray with whitish and dark brown lines; occurs during end of April and beginning of May. (Germany.) *Pupa* overwinters in shallow earth. *Larva*, length 10 mm.; color grass green; head and thoracic shield black; occurs from May until July; draws berries and adjoining leaves together by a web; feeds on fruit. *Egg* deposited singly on twigs (see text fig. 64).

Distribution: Europe.

SORAUER, P. *Handbuch der Pflanzenkrankheiten*, 3d., 1913, vol. 3, p. 336.



FRUIT FLIES LIKELY TO BE IMPORTED.
FIGS. 1, 2.—*Riora musae*. FIGS. 1a, 2a, 3a.—*Dacus psidii*. (Froggatt.)



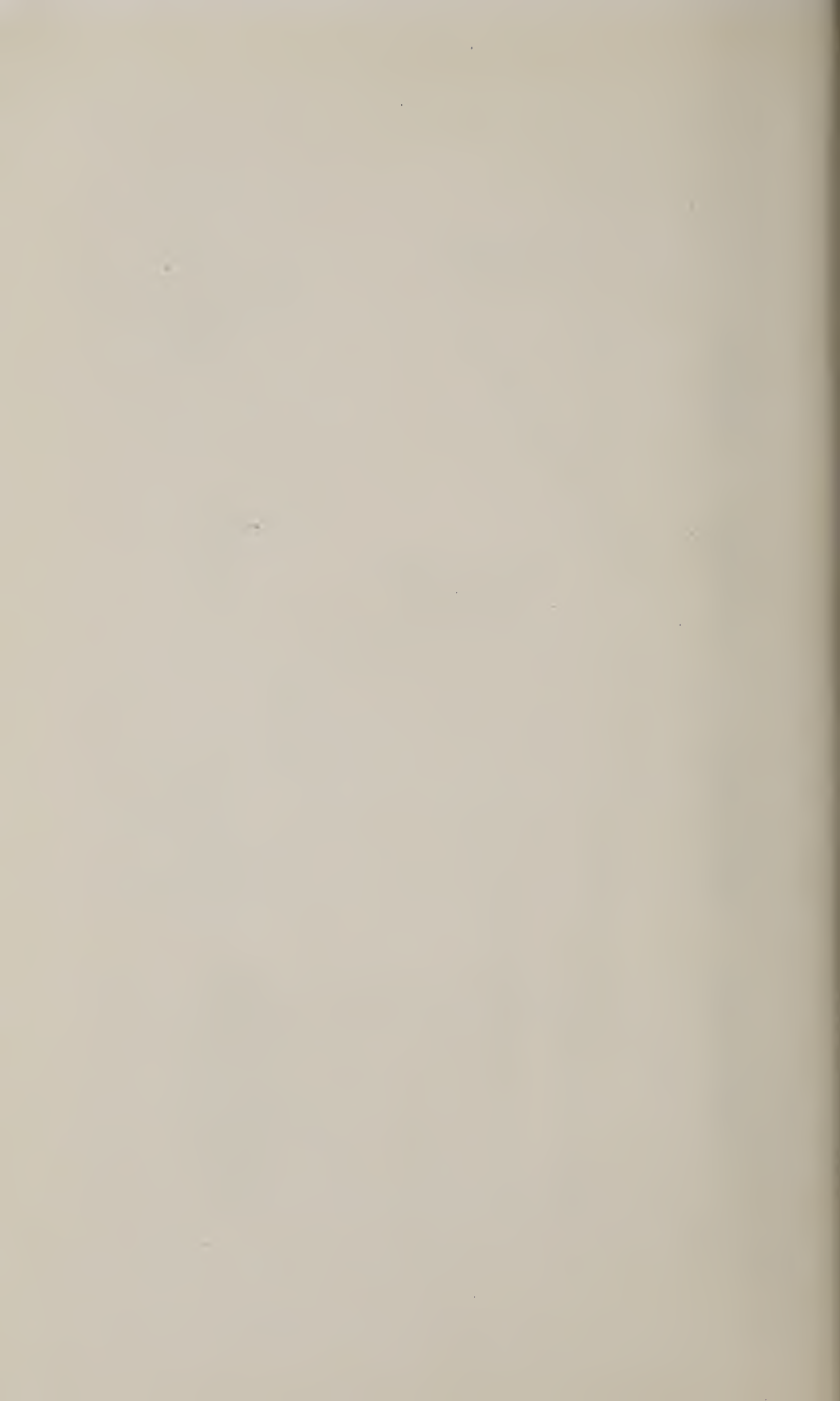
FRUIT FLIES.

FIGS. *a*, *c*.—The Mandarin fruit fly (*Dacus ornatissimus*) and wing. FIGS. *b*, *d*.—The banana fruit fly (*Dacus curvipennis*) and wing. (Froggatt.)



INJURIOUS GRAIN INSECTS.

FIGS. a, b.—*Haplothrips aculeata*; c, *Limothrips denticornis*; d, *Haplothrips tritici*; e, g, *Oria musculosa*; f, h, *Trachea basilinea*; i, n, *Hylemyia coarctata*; k, *Isosoma noxiale*; l, m, *Trachelus tabidus*. (Kurdjumov.)



Incurvaria capitella Clerck.

(Currant Shoot Borer. Tineidæ; Lepidoptera.)

Hosts: Currants; especially red currants.*Injury:* Seldom serious; tunnels the shoots.

Description and biology: *Adult*, wing expanse $\frac{1}{2}$ inch. Forewings dark brown with purplish iridescence; near base a transverse yellow band and two yellow spots near tip; head deep yellow. Occurs from mid May into June. *Pupa*, brown, in loose cocoons in tunneled shoots. *Larva*, dull greenish, with red patch on ninth segment; head and first thoracic segment black. Hatch in summer, feed on seeds in fruit, then spin hibernaculum on bark; attack buds and shoots in spring causing the tips to wilt; mature in April and May. *Eggs* are colorless, lemon-shaped, 0.67 mm. long.

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 213.

Notocella roborana Treitschke.

(Currant Fruit Moth. Tortricidæ; Lepidoptera.)

Host: Currant, rose, *Rubus* sp., whitethorn, oak.*Injury:* Hollows out ripening currants.

Description and biology: *Adult*, forewing white, mixed with dull gray before the border; rusty red at point; base gray brown; speculum dotted black; palpi reddish brown. On wing June and July (Germany). *Pupates* in currant leaves and the stage lasts 3 weeks. *Larva*, length 17 mm.; plump, brown, head yellowish brown, neck and anal shield black; on each segment a brown wart, each with a light bristle; webs up leaves and fruit; occurs in early spring.

FIG. 64.—Gooseberry moth (*Zophodia convolutella*): Adult larva, injury.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 286.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 212.

COLLIGNE, W. A Manual of Injurious Fruit Insects, 1912, p. 163.

B. OTHER IMPORTANT CURRANT AND GOOSEBERRY INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Chionaspis salicis Linnæus; Europe; *Ribes sanguineum*.**Epidiaspis piricola* Del Guercio; Italy, France, Portugal, Germany, England.*Fiorinia grossulariæ* Maskell; New Zealand.

Unarmored—

Lecanium coryli Linnæus; Great Britain.*Lecanium rehi* King; Europe.*Lecanium rubi* Schrank; Europe.*Phenacoccus socius* Newstead; British Isles.*Pseudococcus arecæ* Maskell; New Zealand.

GRAINS AND GRASSES.

(Family Gramineæ.)

Under this heading are treated the insects attacking the grains and grasses, except corn, sorghum, and sugar cane, which are treated separately. This section relates especially to barley (*Hordeum vulgare* Linnæus), millet (*Panicum* spp.), oats (*Avena sativa* Linnæus), rye (*Secale cereale* Linnæus), timothy (*Phleum pratense* Linnæus), and wheat, emmer, and spelt (*Triticum sativum* Lam.). Descriptions of these various crops are given in their proper alphabetic order.

A. BETTER KNOWN GRAIN INSECTS LIKELY TO BE IMPORTED.**Lema cyanella** Linnæus; **Lema melanopus** Linnæus.

(Grain Leaf Beetles. Chrysomelidæ; Coleoptera.)

Hosts: Grasses, grains, especially oats.*Injury:* Feed on the leaves, stem and seed. Causes millions of dollars damage in some years.*Biology:* Eggs shining yellow laid in rows of 10-20 near the midvein, and 40-50 on a leaf. The larvæ feed on the leaves. *L. cyanella* pupates in a cocoon on the plant; *L. melanopus* pupates in the ground. The adults also feed on the foliage.*Distribution:* Europe, Southwest Asia. Serious only in South Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 509.

***Pharaxonotha kirschi** Reitt.

(Mexican Grain Beetle. Cryptophagidæ; Coleoptera.)

Hosts: Corn, yams.*Injury:* Larvæ and beetles destructive to stored corn and other products.*Description:* Small, shining, deep brown beetles, about three-sixteenth inch long. Larva elongate gray, each segment darker at middle with darker spaces each side bearing rather well-developed tubercles.*Distribution:* Brazil, Guatemala, Mexico, Texas, and South Carolina.

CHITTENDEN, F. H. U. S. Dept. Agr., Bur. Entom., Bul. 96, pp. 8-13, fig. 1, 1911.

***Lophocateres (Ostoma) pusillus** Klug.

(Siamese Grain Beetle. Trogositidæ; Coleoptera.)

Hosts: Corn, rice, seeds of eggplant and gourd, rye, flour.*Injury:* Larvæ and beetles destructive to stored corn and other seeds.*Description:* Flat, brown, with thorax prolonged into acute angles at sides, antennæ clubbed at ends, minute. Larva white with blackish head and last segment elongate.*Distribution:* Liberia, Siam, Ceylon, Java, India, Cochin China, Peru, Guatemala, France, South Carolina, Texas.

CHITTENDEN, F. H. U. S. Dept. Agr., Bur. Entom., Bul. 96, pp. 14-18, fig. 2. 1911.

***Latheticus oryzae** Waterh.

(Long-Headed Flour Beetle. Tenebrionidæ; Coleoptera.)

Hosts: Wheat, corn, barley, rice.*Injury:* Larva and beetle injure stored grain and flour.*Description:* Pale yellow, somewhat flattened beetle; the slenderest of the flour beetles, measuring one-eighth inch.*Distribution:* India, Arabia, Persia, Norway, England, Russia, Texas.

CHITTENDEN, F. H. U. S. Dept. Agr., Bur. Entom., Bul. 96, pp. 25-28, fig. 5. 1911.

Nonagria uniformis Dudgeon.

(Wheat Stem Borer. Noctuidæ; Lepidoptera.)

Hosts: Rice, wheat, sugar cane, millet.*Injury:* Larva bores in stems and pupates in its borings.*Description and biology:* Larva flesh colored with black head. Bores in grass stems.*Distribution:* India, Ceylon, Burma, Celebes.

MAXWELL-LEFROY, H. F. Mem. Dept. Agric. India, Ent. Ser., vol. 1, pt. 2, p. 176.

Pyrausta nubilalis Hübner.

(Millet Stalk Worm. Pyralidæ; Lepidoptera.)

Hosts: Millet, corn, hops, hemp, *Panicum sanguinale*, *Artemisia vulgaris*, *Conyza squarrosa*, and *Arundo*.*Injury:* Bores in the stems.*Description and biology:* *Moth*, wing expanse 28–30 mm., yellow ochre in color with rust colored marks on forewings. *Larva* dirty gray brown with dark dorsal line, and two black spots on each segment, underside whitish, head dark brown, thoracic shield yellowish, 30 mm. long. Bores in the stems and sometimes attacks the ears of corn. In grasses the larva overwinters in the roots.*Distribution:* Europe (Hungary).

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 304, 305, fig. 206.

Ochsenheimeria taurelia Schiffermiller.

(Rye Stem Borer. Tineidæ; Lepidoptera.)

Hosts: Rye, grasses.*Injury:* Quite injurious to winter rye.*Description and biology:* *Moth*, 7 mm. long, with 13 mm. wing expanse, forewings yellowish brown with darker bands, hindwings white in basal part and brown beyond. *Pupates* in the stalk. *Larva* when young greenish or yellow, later yellow with dark head; bores in stems. *Eggs* laid singly.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 242, fig. 175.

***Tinea granelia** Linnæus.

(The Wheat Moth. Tineidæ; Lepidoptera.)

Hosts: Wheat, barley.*Injury:* Very serious injury to the seed heads.*Description and biology:* *Adult*, a tiny moth colored a rich brownish yellow with the hindwings larger than the front and greenish yellow. *Pupa* a small brown chrysalid. *Larva* not over one-half inch long, yellowish; bores in the seed head, eating all but the husks.*Distribution:* Victoria, Australia, Europe, North America.

FRENCH, C. Handbook of the Destructive Insects of Victoria, pt. 3, pp. 128–132, pl. 55.

Clinodiplosis mosellana Géhin; **Clinodiplosis equestris** Wagner; ***Contarinia tritici** Kirby.

(Grain Gall Midges. Itonididæ [Cecidomyiidae]; Diptera.)

Species: *Cl. mosellana*; France; wheat, rye. *Cl. equestris*; Europe; wheat. **C. tritici*; Europe, introduced into United States; wheat, rye, barley.*Injury:* Very serious injury to grain, especially in United States.

Description: Fly of *equestris* red, of the other two orange yellow. Maggot of *equestris* blood red, of the other two orange or yellow. Breed in the stems and cause gall formation.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 442, 447, 448.

***Lasioptera cerealis* Lindeman.**

(Rye Midge. Itonididæ [Cecidomyiidæ]; Diptera.)

Hosts: Rye, *Triticum repens*, *Calamagrostis lanceolata*.

Injury: Attacks the stems.

Description and biology: Fly black, abdomen white banded; 3 mm. long. Larva brick red, 5mm. long.

Distribution: Russia.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 457.

***Mayetiola avenæ* Marchal.**

(Oats Gall Midge. Itonididæ [Cecidomyiidæ]; Diptera.)

Host: Oats.

Injury: Forms galls in the stems.

Description and biology: Fly black, marked with red, with a band of silver-gray hairs on each side; length 3.2 mm. Has two generations.

Distribution: France.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 449, fig. 272.

***Phytophaga (*Mayetiola*) destructor Say.**

(Hessian Fly. Itonididæ [Cecidomyiidæ]; Diptera.)

The well-known Hessian fly is a conspicuous example among our imported pests. It is now distributed over Asia, Europe, and North America.

***Porricondyla cerealis* Sauter.**

(Grain Maggot. Itonididæ [Cecidomyiidæ]; Diptera.)

Hosts: Barley, oats, rye, spelt.

Injury: Occasionally injurious. Breeds behind the leaf sheath.

Description and biology: Fly, antennæ 13-jointed, thorax black, abdomen red, length 2.2 mm. Maggot, 3 mm. long, chrome red.

Distribution: Germany.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 441.

***Hylemyla coarctata* Fallen.**

(Wheat Bulb Fly. Anthomyidæ; Diptera.)

Hosts: Rye, wheat, barley.

Injury: Feeds in the stems; very destructive.

Description and biology: Fly yellowish gray, strongly bristled; thorax without stripes; abdomen with dark median stripe; antennæ black; length 7 mm. Maggot yellowish, 6 mm. long. (See plate XXIX figs. i, n.)

Distribution: Middle and north Europe. One specimen is recorded from Colorado.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 431, 432, fig. 263.

Hydrellia griseola Fallen.

(Grain Leaf Miner. Ephydridæ; Diptera.)

Hosts: Barley, oats, grasses.*Injury:* Mines the leaves.*Description and biology:* *Adult* fly metallic brown, thickly dusted with gray; undersides and palpi yellow; antennæ black, face and beak brown; 2.75 mm. long. *Larva* 2 mm. long.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 408, 409, fig. 254.

Camarota flavitarsis Meigen.

(Grain Fly. Oscinidæ; Diptera.)

Hosts: Wheat, grasses.*Injury:* Bores in stems.*Description and biology:* *Fly*, blue black, undersides white, length 2.5 mm. *Larva* and pupa with two large stigmal hooks at apex.*Distribution:* France.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 412, 413.

Chlorops tæniopus Meigen.

(Straw Fly. Oscinidæ; Diptera.)

Hosts: Wheat, rye, barley, grasses.*Injury:* Bores in the stems of grains.*Description and biology:* *Fly*, yellow, with three black lines on thorax, four black cross bands on abdomen and black antennæ; length, 3–4 mm. *Maggot*, yellowish white, 5–7 mm. long. Winters in stem near roots.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 412, 413.

***Oscinis frit** Linnæus (**Oscinis pusilla** Meigen).

(Frit Flies. Oscinidæ; Diptera.)

Hosts: Oats, barley, wheat, rye.*Injury:* Mines the stems of grains. Serious pests.*Description and Biology:* *Adult* fly, shining black, metallic. *Larva*, white, legless. Mines the stems and roots.*Distribution:* Europe, America.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 410, 411.

B. OTHER IMPORTANT GRAIN INSECTS.

HEMIPTERA.

Lygæidæ.*Nysius vinitor* Bergroth; Australia. (See Fruit.)**Jassidæ.***Jassus sexnotatus* Fallen of Germany is a very injurious insect to wheat, barley, oats, and grasses. The eggs might be imported with straw during the winter. This is a bright-yellow leaf hopper with black markings, measuring about 3.75 mm. in length.

THYSANOPTERA.

Haplothrips tritici Kurdjumov, the Europe grain thrips; Europe; often winters in wheat stubbles. (See pl. XXIX, fig. d.)*Haplothrips aculeata* Fabricius (see pl. XXIX, figs. a, b) and *Limothrips denticornis* Haliday; Europe; attack grain. (See pl. XXIX, fig. c.)

COLEOPTERA.

Carabidæ.

Zabrus gibbus Fabricius of Europe attacks wheat, oats, rye, and barley, in both its adult and larval stages. It is a shining black beetle with piecous antennæ and legs, measuring 15 mm. in length and 6 mm. in breadth. The adults hide during the day and feed at night on the grain. They might easily be imported.

Elateridæ.

Agriotes lineatus Linnæus. (See Tobaceo.)

Cerambycidæ.

Calamobius marginellus Fabricius; Europe; bores in stems of wheat.

Chrysomelidæ.

Phyllotreta vittula Redtenbacher. (See Rape.)

Brachyrhinidæ.

Diaprepes abbreviatus Linnæus; West Indies. (See Sugar cane.)

LEPIDOPTERA.

Noctuidæ.

Oria musculosa Hübner; Russia; very destructive, winters in egg stage in stubble. (See pl. XXIX, figs. e, g.)

Hadena secalis Bjerk; Europe; bores in stalks.

Trachea basilinea W. V.; Europe; injures wheat, rye, and other grains. (See pl. XXIX, figs. f, h.)

Pyralidæ.

Chilo simplex Butler; India, Formosa; attacks millet. (See Sugar Cane.)

Dichocrocis punctiferalis Guénée; Queensland; attacks millet. (See Corn.)

Phycitidæ.

Anerastia botella Zuk.; Europe; injurious to rye, wheat, and other cereals

DIPTERA.

Oscinidæ.

Chlorops lineata Fabricius; a tiny reddish frit fly of Europe which breeds in stems of wheat.

Opomyza florum Fabricius, a small fly of Europe which breeds during the winter in the lower parts of the stems of wheat. It is 4.5 mm. long, pale yellow or reddish yellow in color.

Itonididæ (Cecidomyidæ).

Clinodiplosis mosellana Géhin; Europe; breeds in stems of wheat and rye.

HYMENOPTERA.

Cephididæ.

* *Cephus pygmaeus* Linnæus of Europe bores in the stems of wheat, rye, timothy, and other cereals and grasses hibernating as a larva in the lower part of the stem or root. It could easily be imported in straw. The larva is legless. The adult is a black wasplike insect with yellow markings, measuring 7 mm. in length.

Trachelus tabidus Linnæus; Europe; bores in stems. (See pl. XXIX, figs. l, m.)

Chalcididæ.

Isosoma noriale Portsehinski is a very injurious chalcid pest of grain in Russia. The larvæ pass the winter in the stems. (See pl. XXIX, fig. k.)

GRANADILLA.

(*Passiflora quadrangularis*. Passifloraceæ.)

A tropical American vine valuable as a climber and also for its fruit.

DIPTERA.

Trypetidæ.

Dacus passifloræ Froggatt; Fiji. (See Fruit.)

Dacus psidii Froggatt; Fiji. (See Fruit.)

Dacus xanthodes Broun; Fiji. (See Fruit.)

Ceratitis capitata Wiedemann. (See Fruit.)

Ceratitis punctata Wiedemann; Africa. (See Fruit.)

LEPIDOPTERA.

Pyralidæ.

Dichocrocis punctiferalis Guénée; Queensland. (See Corn.)

GRAPE.(*Vitis* spp. Family Vitaceæ.)

Fruit-bearing vines valued both for the fruit itself and for the wines derived therefrom.

A. BETTER KNOWN GRAPE INSECTS LIKELY TO BE IMPORTED.* *Eriophyes vitis* Landois.

(Grape Blister Mite. Eriophyidæ; Acarina.)

Hosts: *Vitis vinifera*, *V. vesuviana*, *V. carinthiaca*, *V. arizonica*, *V. æstivalis*.

Injury: Causes much damage to the vine.

Description and biology: Four-legged blister mite which attacks the leaves, buds, flowers, and berries of the grape.

Distribution: Europe, Armenia, North America.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 119, 120, figs. 94, 95.

Anomala vitis Fabricius.

(Grape Anomala. Scarabæidæ; Coleoptera.)

Host: Grape.

Injury: May be serious.

Description and biology: *Adult*, length 12–17 mm.; green, violet or azure; **body oval**; head, prothorax, and scutellum punctate; elytra convex with distinct longitudinal striæ. Occurs in June and July; crepuscular; feeds on foliage of the vine. *Pupates* in soil in May; stage requires about a month. *Larva* feeds on roots of grass and the vine. Feeds about a year and a half. *Egg* oblong, hatches in about 15 to 20 days.

Distribution: Middle and eastern Europe.

SILVESTRI, F. Dispense di Entomologia Agraria, 1911, p. 310.

Sinoxylon perforans Schrk.; *Sinoxylon sexdentatum* Olivier.

(Grape-vine Flat-headed Borers. Bostrychidæ; Coleoptera.)

Species: *S. perforans*; Tirol, Italy, grape; Europe, oak, elm, horse chestnut. *S. sexdentatum*; Spain, grape; South France, *Quercus sessiliflora*.

Injury: Bore in the stems, branches, and trunk; sometimes causing very serious injury.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 489.

Vesperus spp.

(Grape Borers. Cerambycidæ; Coleoptera.)

Species: *V. xatarti* Dufour; France; grape. *V. luridus* Rossi; Italy; grape. *V. strepens* Fabricius; France; grape, rose, forest trees. *V. mauretanicus* Dry; Algeria, Spain; grape, olive.

Injury: Bore in stems.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 498.

* *Bromius obscurus* Linnæus.

(Grape Root Worm. Chrysomelidæ; Coleoptera.)

Hosts: Grape, *Epilobium*, etc.

Injury: Sometimes serious. Attacks both the roots and the growing parts of the vine.

Description and biology: The species has two varieties, *obscurus*, which is black, and *vitis* Fabricius, which is brown. The eggs are laid in crevices beneath the inner

layers of bark on old wood, and also on leaves, in clusters of 4 to 30. *Eggs* yellowish white, elongate cylindrical. *Larva* white, with yellowish-brown head, short legs. *Pupa* white, formed in earthen cell. The larva feeds on the roots several feet under ground, doing much damage. The adults feed on the foliage and fruit.

Distribution: Europe, Asia, North Africa, and introduced into California.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 512, 513.

QUAYLE, H. J. California Agr. Exp., Sta. Bul. 195, 25 pp., 18 figs.

***Haltica ampelophaga* Leesb.**

(Vine Flea-beetle. Chrysomelidæ; Coleoptera.)

Hosts: Grape, willow.

Injury: Serious. Defoliation.

Description and biology: *Adult*, length 4 mm.; brilliant green, sometimes deep blue-green. Two generations, first appears in April (France), feeds on leaves. Pass winter as adults at bases of vines, in bark, etc. *Pupate* in soil. *Larva*, length 6 mm., black;



FIG. 65.—Vine flea-beetle (*Haltica ampelophaga*): Adult, larva, and injury. (v. Rendu.)

feeds on leaves, flowers, and shoots. Larval period of first generation about a month. *Eggs* clear yellow, oblong; placed on under surface of leaves in clusters of about 30. (See text fig. 65.)

Distribution: France, Italy, Spain, Algiers.

MONTILLOT, L. Les Insectes Nuisibles, 1891, p. 116.

GUENAU, G. Entomologie et Parasitologie Agricoles, 1904, p. 340.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 523, 524.

***Scelodnota strigicollis* Motschulsky.**

(Chrysomelidæ; Coleoptera.)

Host: Grape.

Injury: Serious pest.

Description and biology: Probably similar to grape rootworm.

Distribution: India.

MAXWELL-LEFROY, H. F. Indian Insect Life, 1909, p. 359.

***Brachyrhinus* (*Otiorhynchus*) spp.**

(Grape Root Weevils. Brachyrhinidæ (*Otiorhynchidæ*); Coleoptera.)

The weevils of this genus breed at the roots of plants and are very destructive as adults, often defoliating vineyards.

Species: B. raucus Fabricius; Germany, France; adults attack foliage of apple, pear cherry, grape. *B. singularis* Linnæus; Europe (England); adults attack grape, grafted fruit trees, oak, rose, hops, *Rhododendron*, pines, gherkins, spruce, and strawberries. *B. turca* Boheman; Russia; breeds at the roots of grape. **B. sulcatus* Fabricius; Europe, introduced into America and Australia; breeds at the roots of grape, strawberry, and many other plants and is a very destructive pest. *B. populeti* Boheman; Hungary; adults injurious to grape. *B. ligustici* Linnæus; Europe; attacks grape, peach, hops, beans, beets, asparagus, lucerne. Breeds at the roots and is very destructive. *B. armatus* Boheman, *B. asphaltinus* Germar, *B. corruptor* Host., *B. globus* Boheman, *B. teretirostris* Stierlin and *B. tristis* Scopoli are also recorded from grape.

Description: These weevils are practically all black, oval, fairly large, with broad blunt beaks.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 541-543.

BARGAGLI, P. Rassegna Biologia Rincofori Europei, 1883-1887.

***Boarmia gemmaria* Brahm.**

(Geometridæ; Lepidoptera.)

Hosts: Grape, wild honeysuckle, rose.

Injury: Very injurious. Defoliation.

Description and biology: *Adult*, wings 19-20 mm.; brownish gray with white markings. *Larva*, grayish brown in color, with dark yellow and black spots and dark wavy side lines; occurs in July; winters in sheltered places. *Pupates* during spring in ground.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 338.

***Cryptoblabes gnidiella* Mill.**

(Pyralidæ; Lepidoptera.)

Host: Grape.

Injury: To fruit.

Description: *Adult*, wings lead gray, two diagonal whitish stripes between which are blackish spots. *Larva*, length 14 mm., dirty brown with broad, dark side stripes. Feeds on unripe grape berries.

Distribution: Southern Europe, Egypt.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 311.

***Sciopteron regale* But.**

(Grape Gun Worm. Sesiidæ; Lepidoptera.)

Host: Grape.

Injury: Bore in canes of the grape; very destructive in Japan.

Description and biology: *Adult* moth, about 18 mm. long and with wing expanse of 37 mm.; general color orange and black. *Larva*, 18 to 25 mm. long, yellow, feet and head darkish brown. *Pupa*, about 18 mm. long, rich amber brown in color.

Distribution: Japan.

MASKEW, F. Cal. State Hort. Com. Monthly Bulletin, vol. 2, No. 10, 1913, p. 677.

***Clysia ambiguella* Hübner.**

(The Cochyliis. Tortricidæ; Lepidoptera.)

Host: Grape.

Injury: Very serious to blossom clusters and fruit. One of the worst grape pests of Europe.

Description and biology: *Adult*, wing expanse 14-15 mm.; forewing yellow, with a large dark brown transverse band; hindwing gray. Two generations. First occurs at time of flowering of grape; second generation in early August (France). *Pupates* in early winter under bark scales, in crevices of grape stakes, etc. *Larva*, length 12 mm., at first whitish, later taking on a rose color. *Egg* placed singly on blossom clusters and on grapes. (See text fig. 66.)

Distribution: Europe, Asia Minor, Japan, India.

MONTILLOT, L. Entomologie et Parasitologie Agricoles, 1904, p. 335.

Polychrosis botrana Schiffermiller.

(The Pyralid of the Vine. Tortricidæ; Lepidoptera.)

Host: Grape.

Injury: Very injurious. Attacks grape blossoms and fruit.

Description and biology: *Adult*, wing expanse 12 mm.; forewings pale yellow with three transverse brown lines; hind wings grayish brown. Three annual generations.

Pupa brown. *Larva*, length 1 cm.; green in color. *Eggs* deposited on berries and on blossom clusters. (See text fig. 67.)

Distribution: Germany, Austria-Hungary, Switzerland, France, Italy, Asia Minor.

MONTILLOT, L. Les Insectes Nuisibles, 1891, p. 120.

GUÉNAUX, G. Entomologie et Parasitologie Agricoles, 1904, p. 340.

IMPORTANT GRAPE INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

Aspidiotus (Evaspidiotus) labiatarum Marehal; Corsica, Italy.

Aspidiotus (Pseudaonidia) articulatus Morgan; West Indies.

Aspidiotus (Pseudaonidia) tesserata De Charmoy; Mauritius, Mexico, Antigua.



FIG. 66.—Grape worm (*Clysia ambiguella*): Adult, pupæ, larvæ, egg, and injured grapes. (Silvestri, Sorauer.)

Aspidiotus (Chrysomphalus) pedroniformis Cockerell and Robinson; Philippines; *Vitis vinifera*.

Aspidiotus (Pseudaonidia) fossor Newstead; Barbados.

Aspidiotus (Targionia) vitis Signoret; France, Algiers, Germany, Italy, Sicily.

Chionaspis vitis Green; Ceylon, Japan.

Unarmored—

Cryptinglisia lounsburyi Cockerell; on roots; Cape Colony.

Gueriniella serratulæ Fabricius; Algeria; Europe.

Icerya palmeri Riley & Howard; Mexico.

**Lecanium persicæ* Fabricius; Australia, France, Italy, Caucassus, California.

Lecanium vini Bouché; France.

Neolecanium silveirai Hempel; on roots; Brazil.

**Palæococcus rosæ* Riley & Howard; Jamaica.

Pseudococcus filamentosus Cockerell; Japan, Hawaii.

Pseudococcus subterraneus Hempel; on roots; Argentina.

Pseudococcus vitis Niedzielski; North Africa, France, Europe, Palestine.

Pulvinaria vinifera King.

Rhizæcus falcifer Künckel; France, Algeria.

Solenococcus muratæ Kuwana; Japan.

Lygæidæ.

Nysius vinitor Bergroth; Australia. (See Fruit.)

COLEOPTERA.

Buprestidæ.

**Agrilus viridis* Linnæus; Europe. (See Oak.)

Scarabæidæ.

Adoretus umbrosus Fabricius; Pacific Islands. (See Rose.)

Cerambycidæ.

Cerambyx miles Bon.; Austria; bores stems of *Vitis vinifera*.

Heterachthes æneolus Bates; Mexico; bores stems of *Vitis vinifera*.

Curculionidæ.

Orthorrhinus kluggi Schönherr; Victoria; bores in canes.

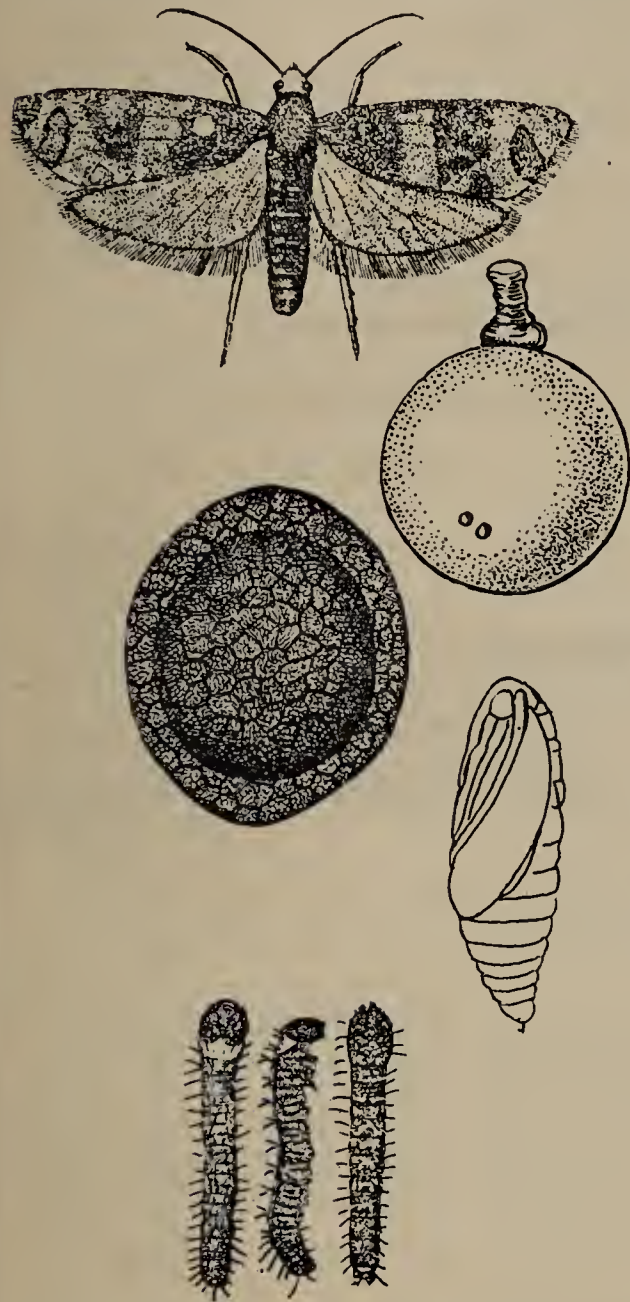


FIG. 67.—Grape pyralid (*Polychrosis botrana*): Adult, larvæ, pupa, egg, and injured grape. (Silvestri.)

Ceroplastes singularis Newstead; British East Africa, Uganda.

Ceroplastes vinsonii Signoret; Mauritius.

Coccus acuminatus Signoret; Hawaii, Ceylon.

Coccus viridis Green; Uganda, India, Mauritius, Ceylon, Brazil.

Eriococcus coriaceus Maskell; Victoria, New South Wales, Queensland.

Icerya montserratensis Riley & Howard; New South Wales; *Psidium pomiferum*.

Icerya seychellarum Westwood; Mauritius.

Inglisia conchiformis Newstead; Uganda.

Pseudococcus grandis Hempel; Brazil.

Pseudococcus virgatus Cockerell; China, Japan, Jamaica.

Pseudokermes nitens Hempel; Brazil.

Pulvinaria cupaniæ Cockerell; Jamaica.

Pulvinaria ficus Hempel; Brazil, Barbados, Montserrat, Antigua, St. Kitts.

Saissetia discoides Hempel; Brazil.

Saissetia psidii Green; Ceylon.

LEPIDOPTERA.

Tortricidæ.

Capua angustiorana Haworth; Europe, Asia, Africa. (See Apricot.)

Zygænidæ.

Ina ampelophaga Boyle; Europe, Caucasus, Palestine; attacks buds and leaves.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann, attacks *Vitis vinifera*. (See Fruit.)

Itonididæ.

Contarinia viticola Rübsaamen; Europe; breeds in buds and flowers.

GUAVA.

(*Psidium guajava*, etc. Family Myrtaceæ.)

Evergreen trees and shrubs of tropical and subtropical America, yielding delicious fruits. Several species are grown in Florida and California.

IMPORTANT GUAVA INSECTS.

HEMIPTERA.

Coccidæ.

Armored—

**Aspidiotus (Pseudaonidia) articulatus* Green; Jamaica.

Aspidiotus (Pseudaonidia) trilobitiformis Green; Ceylon. (See citrous.)

**Parlatoria ziziphus* Lucas; Philippine Islands.

Chionaspis (Phenacaspis) megaloba Green; Ceylon.

Unarmored—

Cardiococcus umbonatus Cockerell; Mexico.

Ceroplastes campinensis Hempel; Brazil.

Ceroplastes grandis Hempel; Brazil.

Ceroplastes psidii Chavannes; Brazil, Europe.

Aleyrodidae.

Aleurodicus cocois Curtis; West Indies, Mexico, Central and South America, attacks *Psidium guajava*. (See Coconut.)

THYSANOPTERA.

* *Heliothrips rubrocinctus* Giard; West Indies, Ceylon, Uganda, Florida, attacks *Psidium guajava*. (See Fruits.)

COLEOPTERA.

Brachyrhinidae.

Diaprepes abbreviatus Linnæus; West Indies. (See Sugar cane.)

LEPIDOPTERA.

Lycænidae.

Virachola insocrates Fabricius; India; bores in fruit. (See Fruit.)

Pyalidae.

Dichocrocis punctiferalis Guénée; Queensland. (See Corn.)

Lasiocampidae.

Suana concolor Walker; Java.

DIPTERA.

Trypetidae.

Anastrepha fraterculus Wiedemann, attacks *Psidium guajava*. (See Fruit.)

Anastrepha serpentina Wiedemann, fruit fly; Lesser Antilles; attacks *Psidium guajava*. ✓

Anastrepha ludens Loew; Mexico. (See Fruit.)

Ceratitis capitata Wiedemann; attacks *Psidium cattleianum* and *P. guajava*. (See Fruit.)

Ceratitis punctata Wiedemann; Africa. (See Fruit.)

Ceratitis anonae Graham; Africa. (See Fruit.)

Dacus psidii Froggatt; Fiji. (See Fruit.)

Dacus xanthodes Broun; Fiji. (See Fruit.)

Dacus diversus Coquillett; India. (See Fruit.)

HAWTHORN; MEDLAR.

(*Mespilus* spp. [*Crataegus*]. Family Rosaceæ.)

Small fruit-bearing trees and shrubs of the northern hemisphere, grown mainly as ornamental shrubbery.

IMPORTANT HAWTHORN INSECTS.

ACARINA.

Eriophyidae.

Eriophyes goniothorax Nalepa, blister mite; England; attacks leaves of *Mespilus oxyacantha*.

HEMIPTERA.

Coccidae:

Armored—

Aspidiotus (*Diaspidiotus*) *pyri* Lichtenstein; Europe; *Mespilus heterophylla*, *M. oxyacantha*.

Diaspis lepèrii Signoret; Europe; *Mespilus monogyna*.

Unarmored—

Ceroplastes rusci Linnæus; Europe.

* *Lecanium bituberculatum* Targioni-Tozzetti; Europe; Oregon; *Mespilus monogyna*, *M. oxyacantha*.

Lecanium coryli Linnæus; Europe; *Mespilus coccinea*, *M. germanica*, *M. monogyna*, *M. oxyacantha*, *M. pyracantha*.

Pulvinaria betulae; Europe; *Mespilus germanica*, *M. monogyna*, *M. oxyacantha*.

COLEOPTERA.

Curculionidae.

Magdalis cerasi Linnæus and *M. pruni* Linnæus; Europe; breed under bark.

Magdalis barbicornis Latreille; Europe. (See Apple.)

LEPIDOPTERA.

Geometridæ.

Hibernia aurantiaria Esp., *H. defoliaria* Linnæus and *H. marginaria* Borekh; Germany; defoliators.

Lymantriidae.

Dasychira pudibunda Linnæus and * *Euproctis chrysorrhæa* Linnæus; Europe; defoliators. (See Forest defoliators.)

Lasiocampidae.

Gastropacha quercifolia Linnæus; Europe. (See Fruit.)

Hyponomeutidae.

Argyresthia nitidella Fabricius; England. (See Plum.)

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann. (See Fruit.)

HYMENOPTERA.

Tenthredinidæ.

Macrophya punctum-album Linnæus; Russia; sawfly.

Priophorus padi Linnæus; Europe (See Plum.)

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912

HAZEL; FILBERT; COBNUT.

(*Corylus* spp. Family Corylaceæ.)

Valuable nut-bearing shrubs or rarely trees of America, Europe, and Asia, sometimes used for shrubbery.

A. HAZEL INSECTS LIKELY TO BE IMPORTED.

Eriophyes avellanæ Nalepa; **Eriophyes vermiformis** Nalepa.

(Hazelnut Blister Mites. Family Eriophyidæ; Acarina.)

Hosts: *Corylus avellana*, *C. tubulosa*.

Injury: Cause galls on buds. Serious in England.

Description and biology: Four-legged blister mites which form galls in the spring and summer buds. Very easy to introduce on nursery stock.

Distribution: England, Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 1913, 3d ed., vol. 3, p. 118, fig. 93.

Oberea linearis Linnæus.

(Cerambycidæ; Coleoptera.)

Hosts: Hazelnut, walnut.

Description and biology: *Adult*, beetle occurs from May on. A generation in two years. The *larva* eats pith and wood and pupates in earth. *Eggs* are placed singly under young bark. After oviposition the female rings the twig.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 1913, 3d ed., vol. 3, p. 507.

Curculio nucum Linnæus (**Balaninus**).

(Nut Weevil. Curculionidæ; Coleoptera.)

Hosts: Hazelnut, filbert, cob, oak.

Injury: Causes nuts to fall prematurely.

Description and biology: *Adult*, length 8 mm.; color tawny brown to chocolate brown, densely clothed with golden-brown pubescence; has unusually long snout; occurs in June and July (England). Flies in bright weather. *Pupa* creamy white, pupates in soil. *Larva* length rather more than 8 mm.; creamy white; passes winter in cell in ground. *Eggs* are deposited singly, deep in nut. Incubation requires 8 or 10 days. (See text fig. 68.)

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 299.

Laspeyresia amplana Hübner (*Carpocapsa*.)

(Nut Tortrix. Tortricidæ; Lepidoptera.)

Hosts: Hazelnut, walnut.*Injury*: To fruit.

Description and biology: Forewing cinnamon colored, with large light spots on both sides darkened by brown spots on the inner margin. Flies in July (Germany). *Larva*, dirty white; head and back darker; bores into the nuts; overwinters in soil, pupating in spring. *Eggs* deposited on unripe nuts.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 276.

HENSCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 432.



FIG. 68.—The nut weevil (*Curculio nucum*): Adult puncturing nut. (Guenaux.)

B. IMPORTANT HAZEL INSECTS.

HEMIPTERA.

Coccidæ.

Unarmored—

Lecanium coryli Linnæus;
Europe; *Corylus avellana*, *C. colurna*.

Lecanium pulchrum Marchal;
Europe; *Corylus avellana*.

Phenacoccus aceris Signoret;
Europe; *Corylus avellana*.

Pulvinaria betulæ Linnæus;
Europe; *Corylus avellana*.

COLEOPTERA.

Buprestidæ.

Agrilus angustulus Illiger; *A. subauratus* Gebler; Europe;
bore in bast and sapwood,
especially of saplings.

Elateridæ.

Athous subfuscus Müller, wire-
worm; Europe; injures nuts
and seedlings.

Cerambycidæ.

Oberca linearis Linnæus; Europe; bores in pith of nursery stock.

Chrysomelidæ.

Haltica quercetorum Foudr.; Europe; leaf beetle. (See Oak.)

Curculionidæ.

Magdalis carbonaria Linnæus; Europe; bores in trunks. (See Birch.)

LEPIDOPTERA.

Geometridæ.

Anisopteryx æscularia Schiffermiller; Europe; feeds on foliage.

Lymantriidæ.

Dasychira pudibunda Linnæus, and **Lymantria monacha* Linnæus; Europe; defoliators. (See Forest defoliators.)

Notodontidæ.

Phalera bucephala Linnæus; Europe. (See Forests.)

Tortricidæ.

Laspeyresia grossana Haworth (*Carpocapsa*); Europe. (See Beech.)

Hyponomeutidæ.

Argyresthia ephippella Fabricius; Europe. (See Plum.)

HYMENOPTERA.

Tenthredinidæ.

Monoctenus juniperi Linnæus; Europe; sawfly feeds on foliage.

LITERATURE.

- SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.
 NÜSSLIN, Otto. Leitfaden der Forstinsektenkunde, 2d ed., 1913.
 HESS, R. Der Forstschutz, 1900, vol. 2.
 LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

HEMLOCK SPRUCE.

(*Tsuga* spp. Family Pinaceæ.)

Ornamental evergreen trees, very useful for parking, native of North America, East Asia, and the Himalayas. For convenience the insect pests are arranged under Conifers.

HEMP.

(*Cannabis sativa* Linnæus. Family Urticaceæ.)

A native of Asia cultivated for the fiber obtained from its stems. Also used as an ornamental plant.

IMPORTANT HEMP INSECTS.

COLEOPTERA.

Chrysomelidæ.

Psylliodes attenuata Koch; Europe. (See Hops.)

LEPIDOPTERA.

Pyralidæ.

Pyrausta nubilalis Hübner; Europe. (See Grain.)

HOPS.

(*Humulus lupulus* Linnæus. Family Urticaceæ.)

Vines cultivated in Europe and America for the hops, which are used in the brewing of beer.

A. BETTER KNOWN HOPS INSECTS LIKELY TO BE IMPORTED.**Psylliodes attenuata** Koch.

(European Hop Flea-Beetle. Family Chrysomelidæ; Coleoptera.)

Hosts: Hops, hemp, stinging nettle.

Injury: Feeds on foliage. The larva is supposed to breed in the cones of the hops.

Distribution: Europe (Russia, England).

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 522.

Hepialus humuli Linnæus.

(Hop Root Borer. Hepialidæ; Lepidoptera.)

Hosts: Hops, potato, rape, corn, sorrel, dandelion.

Injury: Bores in the roots.

Description and biology: *Moth*, wing expanse 43–68 mm.; male above silvery white, beneath brownish gray, female clay yellow, with pale brick-red marks on forewings. *Larva* yellowish, spotted with black, with dark head; thoracic shield and spots on second and third segments yellowish brown; 50–55 mm. The larva breeds in the roots.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 320.

Cecidomyia humuli Theobald.

(Hop Midge. Itonididæ [Cecidomyidæ]; Diptera.)

Host: Hops.

Injury: Attack the catkins.

Description and biology: Fly very small; larvæ white.

Distribution: England.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 443.

***Agromyza frontalis* Meigen.**

(Hop Leaf Miner. Agromyzidæ; Diptera.)

Host: Hops.

Injury: Mines the leaves.

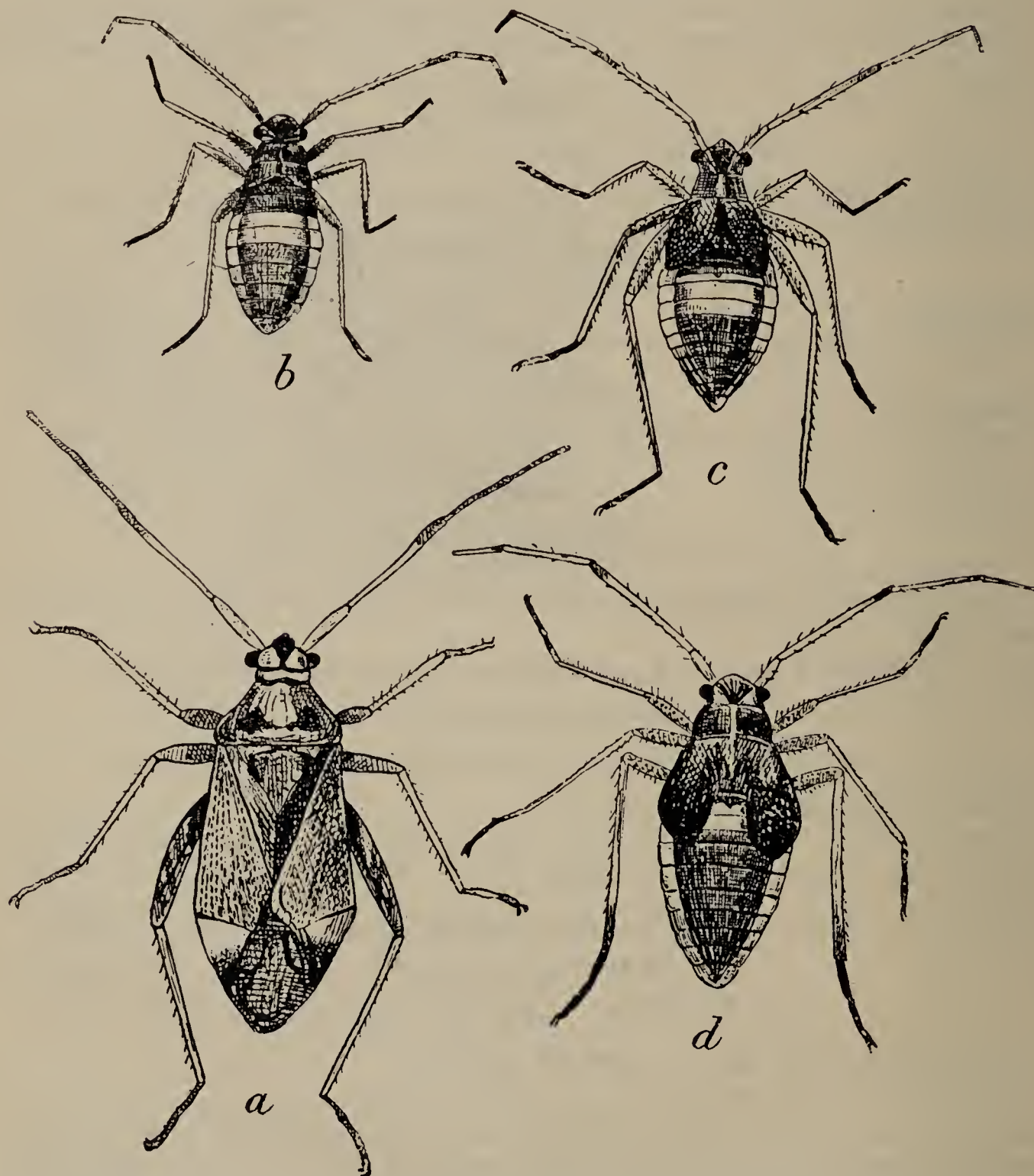


FIG. 69.—Needle-nose hop-bug (*Calocoris fulvamaculatus*): a, Adult; b, early stage of nymph; c, 4th instar nymph; d, 5th instar nymph. (Theobald.)

Description and biology: Pupates in the soil.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 406.

B. OTHER IMPORTANT HOPS INSECTS.

HEMIPTERA.

Miridae (Capsidæ).

Calocoris fulvamaculatus: Needle-nosed hop bug; Europe; sucks juices. (See text, fig. 69.)

COLEOPTERA.

Chrysomelidæ.

Phyllotreta nemorum Linnæus; Europe. (See Crucifers.)

Elateridæ.

Agriotes lineatus Linnæus. (See Tobacco.)

LEPIDOPTERA.

Pyralidæ.

Pyrausta nubilalis Hübner; Europe; bores in stems. (See Grain.)

Noctuidæ.

Hypena rostralis Linnæus; Europe; feeds on foliage.

LITERATURE.

THEOBALD, F. V. Text Book of Agric. Zoology, pp. 260-262, figs. 150, 159. 1913.

REMISCH, FR. VON. Zeitschr. f. Wiss. Insekten biol., band. 13, heft 9, pp. 331-333; heft 10, pp. 363-368. 1908.

HORNBEAM.

(*Carpinus betulus* L., etc. Family Betulaceæ.)

Hard-wooded trees much used in tool making. Occur in Europe, Asia, and America.

IMPORTANT HORNBEAM INSECTS.

HEMIPTERA.

Coccidæ:

Unarmored—

Pulvinaria betulæ Linnæus; *Lecanium coryli* Linnæus, and *Lecanium pulchrum* Marchal; Europe.

COLEOPTERA.

Anobiidæ.

Xestobium rufovillosum DeGeer; Europe; bores in the wood.

Ptilinus pectinicornis Linnæus; Europe; bores in the wood.

Elateridæ.

Athous subfuscus Müller; wireworm; Europe; injures fruit and seedlings.

Scarabæidæ.

Amphimallon solstitialis Linnæus; Europe; the larvæ injure the roots of small plants while the adults injure the shoots.

Melolontha hippocastani Fabricius, and *M. melolontha* Linnæus; Europe; larvæ injure roots of seedlings.

Scolytidæ.

Anisandrus dispar Fabricius; Europe; galleries wood.

Scolytus carpini Ratzeburg; Germany; galleries in bark, bast, and sapwood.

Xyloterus domesticus Linnæus; Germany; galleries in bark and sapwood.

LEPIDOPTERA.

Geometridæ.

Hibernia defoliaria Linnæus and *H. marginaria* Borekh.; Europe; defoliators.

Lymantriidæ.

Dasychira pudibunda Linnæus; **Euproctis chrysorrhoea* Linnæus, **Lymantria monacha* Linnæus, **Porthetria dispar* Linnæus, *Porthesia similis* Fuessly; Europe; defoliators. (See Forest defoliators.)

LITERATURE.

LINDINGER, L. Die Schildläuse (Coccidæ). 1912.

HESS, R. Der Forstschutz, 1900, vol. 2.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed. 1913.

HORSE-CHESTNUT; BUCKEYE.

(*Aesculus* spp. Family Sapindaceæ.)

Ornamental trees and shrubs, desirable for shade trees, occurring in North America, Asia, Europe.

A. HORSE-CHESTNUT INSECT LIKELY TO BE IMPORTED.* *Zeuzera pyrina* Linnæus.

(Horse-chestnut Borer. Cossidæ; Lepidoptera.)

Hosts: Elm, alder, ash, beech, birch, horse-chestnut, linden, maple, oak, willow, poplar, buckthorn, spindle tree, mountain ash.

Injury: Bores in bark and wood of trees.

Description and biology: Moth white, with steel-blue round spots; wing expanse 50–70 mm. Larva yellowish, more flesh-colored when younger, with shining black, warts; head, thoracic shields and legs black. The larva bores in the wood and pupates in a cell of frass near the outside.

Distribution: Europe, North Africa, and introduced into North America.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 1913, 3d ed., vol. 3, p. 321.

HESS, RICHARD. Der Forstschutz, 1900, vol. 2, pp. 84, 85.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 321, 322, figs. 273–275.

B. IMPORTANT HORSE-CHESTNUT INSECTS.

HEMIPTERA.

Coccidæ.

Unarmored—

Lecanium coryli Linnæus; Europe; *Aesculus hippocastanum*, *A. pavia*.

COLEOPTERA.

Anobiidæ.

Xestobium rufovillosum De Geer; Europe; bores in dead wood of standing and living trees.

Bostrychidæ.

Sinoxylon perforans Schr.; Europe; bores in branches.

Scarabæidæ.

Melolontha hippocastani Fabricius and *M. melolontha* Linnæus; Europe; larvæ injure roots of seedlings.

Cerambycidæ.

Phymatodes lividus Rossi; Germany; bores in wood of felled trees and lumber.

Ipidæ.

Anisandrus dispar Fabricius; Germany; galleries in wood.

LEPIDOPTERA.

Geometridæ.

Anisopteryx æscularia Schiffermiller; Europe; feeds on foliage.

LITERATURE.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

HORSE-RADISH.

(*Radicula armoracia*. Family Cruciferæ.)

An herb cultivated for its roots.

IMPORTANT HORSE-RADISH INSECTS.

COLEOPTERA.

Chrysomelidæ.

Phyllotreta nigripes Fabricius, and *P. armoraciæ* Koch; Europe, North America. (See Crucifers.)

Phyllotreta atra Fabricius; Europe; flea beetle.

LEPIDOPTERA.

Pyralidæ.

Pionea forficalis Linnæus; Europe. (See Cabbage.)

IRIS.(*Iris* spp. Family Iridaceæ.)

Flowering herbs, propagated from roots.

IRIS INSECTS.**DIPTERA.****Syrphidæ.*** *Eumerus strigatus* Fallen, Europe, New York; attacks tubers. (See Onion.)**JICACO; COCOA PLUM.**(*Chrysobalanus icaco*. Family Rosaceæ.)

A tropical plant introduced into Florida.

JICACO INSECTS.**HEMIPTERA.****Aleyrodidæ.***Aleurodicus cocois* Curtis; West Indies, Mexico, Central and South America. (See Coconut.)**DIPTERA.****Trypetidæ.***Ceratitis giffardi* Bezzi; Africa; attacks fruit of *Chrysobalanus ellipticus*. (See Fruit.)*Ceratitis silvestrii* Bezzi; Africa. (See Fruit.)**JUNIPER; RED CEDAR.**(*Juniperus* spp. Family Juniperaceæ.)

Ornamental evergreen trees or shrubs distributed throughout the extratropical regions of the northern hemisphere. The wood is used in finishing interiors of houses, for posts, and the manufacture of small articles, especially pencils. The fruit of *J. drupacea* is edible. Aromatic oils used in medicine are obtained from the fruit and branches of some species.

Eriophyes quadrisetus F. Thoms.

(Juniper blister mite. Eriophyidæ; Acarina.)

*Host: Juniperus communis.**Injury:* Causes deformations.*Description and biology:* A four-legged blister mite which forms gall-like swellings of the fruit and needle. Very easy to introduce on nursery stock.*Distribution:* Europe.**INSECTS INJURIOUS TO JUNIPER.****HEMIPTERA.****Coccidæ.**

Armored—

Aspidiotus maderensis Lindinger; Madeira; *Juniperus cedrus*.* *Chionaspis striata* Newstead; South Europe; *Juniperus drupacea*, *J. fœtidissima*, *J. macrocarpa*, *J. oxycedrus*, *J. phœnicea*.*Cryptaspidiotus mediterraneus* Lindinger; Algeria, Greece; *Juniperus macrocarpa*, *J. phœnicea*.*Diaspis atlantica* Lindinger; Canary Islands; *Juniperus phœnicea*.*Diaspis visci* Schrank; Europe; *Juniperus canadensis*, *J. cedrus*, *J. chinensis*, *J. communis*, *J. drupacea*, *J. excelsa*, *J. macrocarpa*, *J. oxycedrus*, *J. phœnicea*, *J. recurva*, *J. sabina*, *J. sphærica*, *J. torulosa*, *J. virginiana*.*Lepidosaphes juniperi* Lindinger; Anatolia; *Juniperus excelsa*.

Unarmored—

Pseudococcus vovæ Nassonow; Russia; Austria; *Juniperus communis*.

COLEOPTERA.

Ipidæ.

Phlæosinus thujæ Perris; Europe; *Juniperus communis*.

LEPIDOPTERA.

Tortricidæ.

Laspeyresia duplicana Zetterstedt; Europe. (See Conifers.)

BIBLIOGRAPHY.

LINDINGER, L. Die Schildläuse (Coccidæ). 1912.

EICHHOFF, W. Europ. Borkenkäfer. 1881.

KAFIR CORN.

See Sorghum.

KALE.

See Cabbage.

KEI APPLE.

(*Aberia caffra*.)

A tree of Cape of Good Hope, introduced into California and Florida and quite hardy in southern California. A spring plant grown for hedges. The fruit is used as pickles or preserves.

A KEI APPLE INSECT.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann. (See Fruit.)

KOHL-RABI.

See Cabbage.

KOLA; COLA.

(*Sterculia acuminata*. Family Sterculiaceæ.)

Tropical African trees cultivated for the nuts.

A. KOLA INSECTS.

THYSANOPTERA.

* *Heliothrips rubrocinctus* Giard; West Indies, Ceylon, Uganda, Florida. (See Fruits.)

HEMIPTERA.

Coccidæ.

Lecanium cactori Green; Algeria; on pods.

LARCH.

(*Larix* spp. Family Pinaceæ.)

Valuable ornamental and forest trees grown in the colder regions of Europe, Asia, and North America. *L. decidua* (*europæa*), the European larch, yields turpentine and the bark contains tannin, used for tanning leather. For convenience the insect pests are arranged under Conifers.

LETTUCE.

(*Lactuca* spp. Family Compositæ.)

A well-known genus of herbs grown for their edible foliage.

IMPORTANT LETTUCE INSECTS.

COLEOPTERA.

Elateridæ.

Agriotes lineatus Linnæus. (See Tobacco.)

LEPIDOPTERA.

Pyralidæ.

* *Pionea ferrugalis* Hübner; Europe, Asia, North America. (See Cabbage.)

Noctuidæ.

Mamestra brassicæ Linnæus; Europe; feeds on leaves.

LINDEN; BASSWOOD; LIME.

(*Tilia* spp. Family Tiliaceæ.)

Trees distributed generally throughout the northern temperate zone. The wood of several species is easily cut into veneers and is hence in much demand for light boxes for packing fruits, etc. They are valuable honey trees.

A. LINDEN INSECTS LIKELY TO BE IMPORTED.

Eriophyes tiliarius Connold; *Eriophyes tilia* Nalepa.

(Linden Gall Mites. Eriophyidæ; Acarina.)

Host: Tilia europaea.

Injury: The first-mentioned mite forms galls on the flower bracts, and the second on the leaves, but neither is of vital importance.

Distribution: England.

GILLANDERS, A. T. Forest Entomology, 1908, pp. 27, 28, 30, 31, fig. 26.

B. IMPORTANT LINDEN INSECTS.

HEMIPTERA.

Coccidæ.

Armored—

Chionaspis salicis Linnæus; Europe.

Unarmored—

Lecanium coryli Linnæus; Europe.

Xylcoccus filifer Loew; Europe; *Tilia cordata*, *T. grandiflora*.

Pyrrhocoridæ.

Pyrrhocoris apterus Linnæus; Germany; in all stages sucks the juices from the leaves, fruit, and stems.

COLEOPTERA.

Buprestidæ.

Agrilus viridis Linnæus; Europe; bores in stems and branches. (See Oak).

Lampra rutilans Fabricius, and *L. undatus* Fabricius; Europe; bore in bark and wood.

Scarabæidæ.

Melolontha hippocastani Fabricius and *M. melolontha* Linnæus; Europe; larvæ injure roots of seedlings.

Ipidæ.

Ernoporos caucasicus Lind.; bark beetle; Europe.

Ernoporos tilia Panzer; bark beetle; Europe; *Tilia parvifolia*.

Xyloterus domesticus Linnæus, and *X. signatus* Fabricius; ambrosia beetles.

LEPIDOPTERA.

Cossidæ.

Cossus cossus Linnæus, goat moth; Europe; bores in wood. (See Willow.)

* *Zeuzera pyrina* Linnæus; Europe; bores in wood. (See Horse-chestnut.)

Noctuidæ.

Xylina socia Rott.; Europe. (See Plum.)

Geometridæ.

Hibernia aurantiaria Esp., *H. defoliaria* Linnæus, and *H. marginaria* Borekh.; Europe; defoliators.

Lasiocampidæ.

Eriogaster lanestris Linnæus; Germany; defoliator.

Lymantriidæ.

Dasychira pudibunda Linnæus, **Lymantria monacha* Linnæus, **Porthetria dispar* Linnæus, and *Porthesia similis* Fuessly; Europe; defoliators. (See Forest defoliators.)

LITERATURE.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

HESS, R. Der Forstschutz, 1898, 1900.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

LOQUAT.

(*Eriobotrya japonica*. Family Rosaceæ.)

A fruit tree native of China and Japan, much planted in the Gulf States. The fruit occasionally reaches the northern markets.

IMPORTANT LOQUAT INSECTS.

HEMIPTERA.

Coccidæ.

Unarmored—

Ceroplastes vinsonii Signoret; Mauritius; Reunion Island.

LEPIDOPTERA.

Lycænidæ.

Virachola insocrates Fabricius; India; bores in fruit. (See Fruit.)

Pyalidæ.

Dichocrocis punctiferalis Guénée; Queensland. (See Corn.)

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann, fruit fly. (See Fruit.)

Bactrocera tryoni Froggatt; Orient. (See Fruit.)

MAHOGANY.

(*Swietenia mahogoni*. Family Meliaceæ.)

A tropical tree of great importance in the furniture trade, offered by nurserymen of Florida and California.

IMPORTANT MAHOGANY INSECTS.

LEPIDOPTERA.

Cossidæ.

Zeuzera coffeæ Nietner; Orient. (See Coffee.)

Pyalidæ.

Hypsipyla robusta Moore; India; twig borer.

MAIZE.

See Corn.

MAMMEE APPLE.

(*Mammea americana*. Family Guttiferæ.)

Tropical fruit tree now cultivated in Florida and California.

MAMMEE APPLE INSECTS.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann. (See Fruit.)

Dacus xanthodes Broun; Fiji. (See Fruit.)

MANGEL.

See Beet.

MANGO.

(*Mangifera indica*. Family Anacardiaceæ.)

A much-cultivated fruit tree originating in the Orient and now extensively cultivated in the West Indies and also in Florida and California.

A. BETTER KNOWN MANGO INSECTS LIKELY TO BE IMPORTED.

Psylla cistellata Buckton.

(The Mango Shoot Psylla. Psyllidæ; Hemiptera.)

Host: Mango (*Mangifera indica*).*Injury*: Injures terminal shoots by producing imbricated pseudo-cones of a bright green or yellow color in which the larval and pupal stages are passed.*Description*: Adult head small, eyes globose and prominent; abdomen deeply corrugated and ringed; general color of body shining pitchy black.*Distribution*: India.

BUCKTON, G. B. Indian Museum Notes, 1896, vol. 3, No. 2, p. 91.

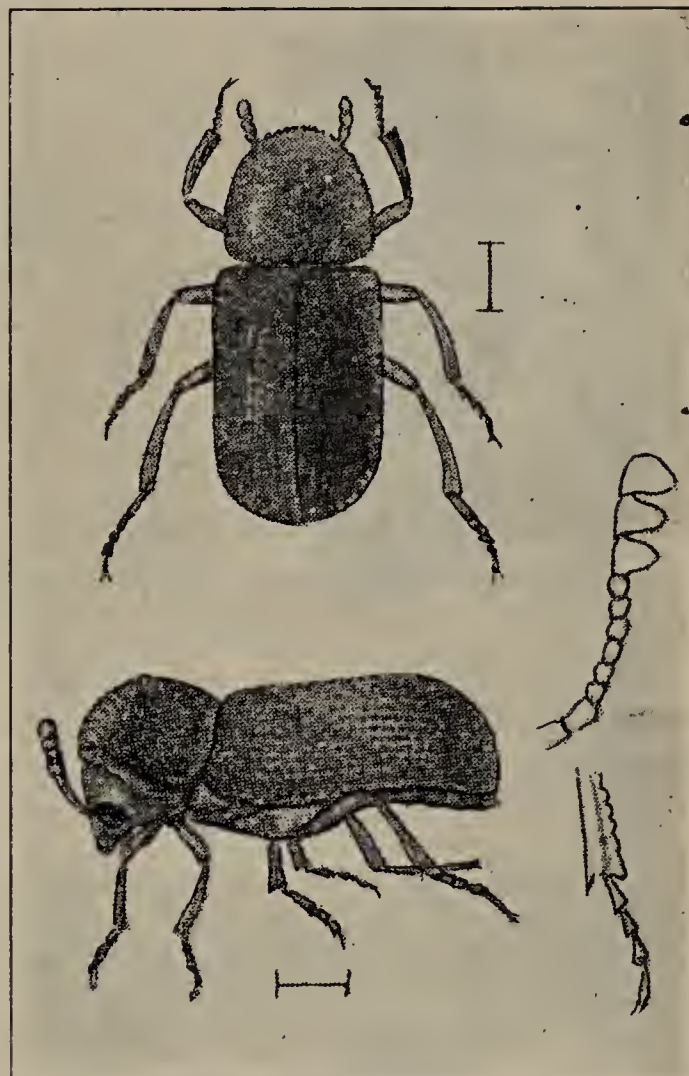
Dinoderus distinctus Lesne.

(Bostrychidæ; Coleoptera.)

Hosts: Mango, bamboo.*Injury*: Infests branches.*Description*: Adult brown, with reddish tinge at base of elytra. Marginal teeth of prothorax very small, the two middle ones longest. Length 3.5 mm. (See text fig. 70.)*Distribution*: India.

MAXWELL-LEFROY, H. Indian Insect Life, 1909, p. 316.

STEBBING, E. P. Indian Forest Insects, 1914, pp. 129, 130.

Fig. 70.—Mango and bamboo borer (*Dinoderus distinctus*): Adults. (Maxwell-Lefroy.)*Plocæderus ruficornis* Newman.

(The Mango Bark Borer. Cerambycidæ; Coleoptera.)

Host: Mango.*Injury*: Considered one of the most formidable pests of the Philippine Islands.*Description and biology*: Adult beetle 23 to 45 mm. in length with antennæ longer than body; body dull blackish in color, antennæ reddish brown, thorax with sharp spine on each side, legs of same rufous color as antennæ. Eggs deposited singly on the bark or in crevices of wounds near lower part of the trunk. Larvæ on hatching bore into the inner part of bark, where the entire grub stage is passed; pupate in a cavity made of grass. (See plate xxx.)*Distribution*: Philippine Islands.

JONES, C. R. The Philippine Agric. Review, 1913, vol. 6, No. 3, pp. 118-124, pls. 24.

Sternochetus gravis Fabricius. (Cryptorhynchus).

(Northern Mango Weevil. Curculionidæ; Coleoptera.)

Host: Mango.*Injury*: This is the common mango weevil of Northern India, and is liable to be introduced in seed.

Description and biology: Adult weevil rusty brown to blackish brown, mottled with grayish patches; length 9 mm. Beak long. The entire development takes place in the fruit, the larvæ first feeding in the pulp, then entering the seed. (See text fig. 71.)

Distribution: India (Bengal, Assam, United Provinces).

STEBBING, E. P. Indian Forest Insects, Coleoptera, p. 436, fig. 289.

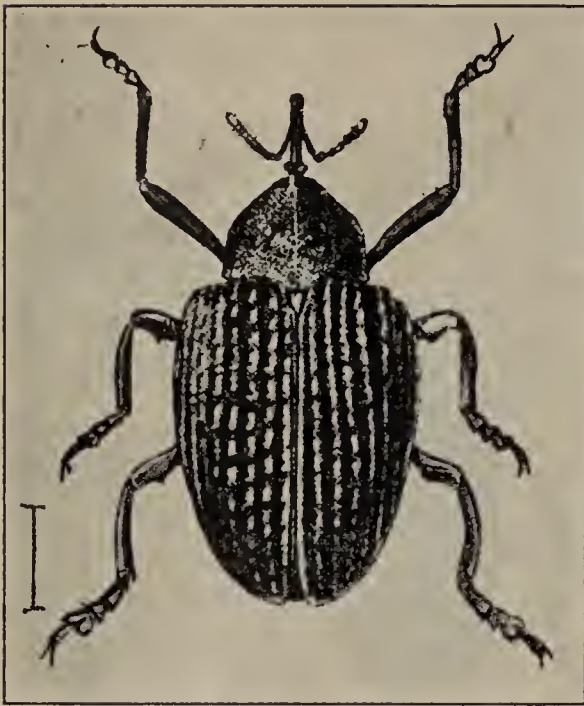


FIG. 71.—Northern mango weevil (*Sternochetus gravis*): Adult. (Maxwell-Lefroy.)

***Sternochetus mangiferae* Fabricius.**
(**Cryptorhynchus.**)

(Mango Weevil. Curculionidæ; Coleoptera.)

Host: Mango.

Injury: Serious enemy of mango, especially in Hawaii, where it is reported to have infested from 60 to 90 per cent of the crop. Liable to be introduced in seed.

Description and biology: Adult weevil, varies from 6 to 8 mm. in length; when nearly developed whitish pink in color, later changing to a dark brown with yellow markings; beak short, thick, and when at rest turned back

beneath the thorax in a groove terminating between the first pair of legs. The egg is deposited in the fleshy part of the fruit, and on hatching the larva enters the seed, where it undergoes its entire development, vacating as an adult.



a

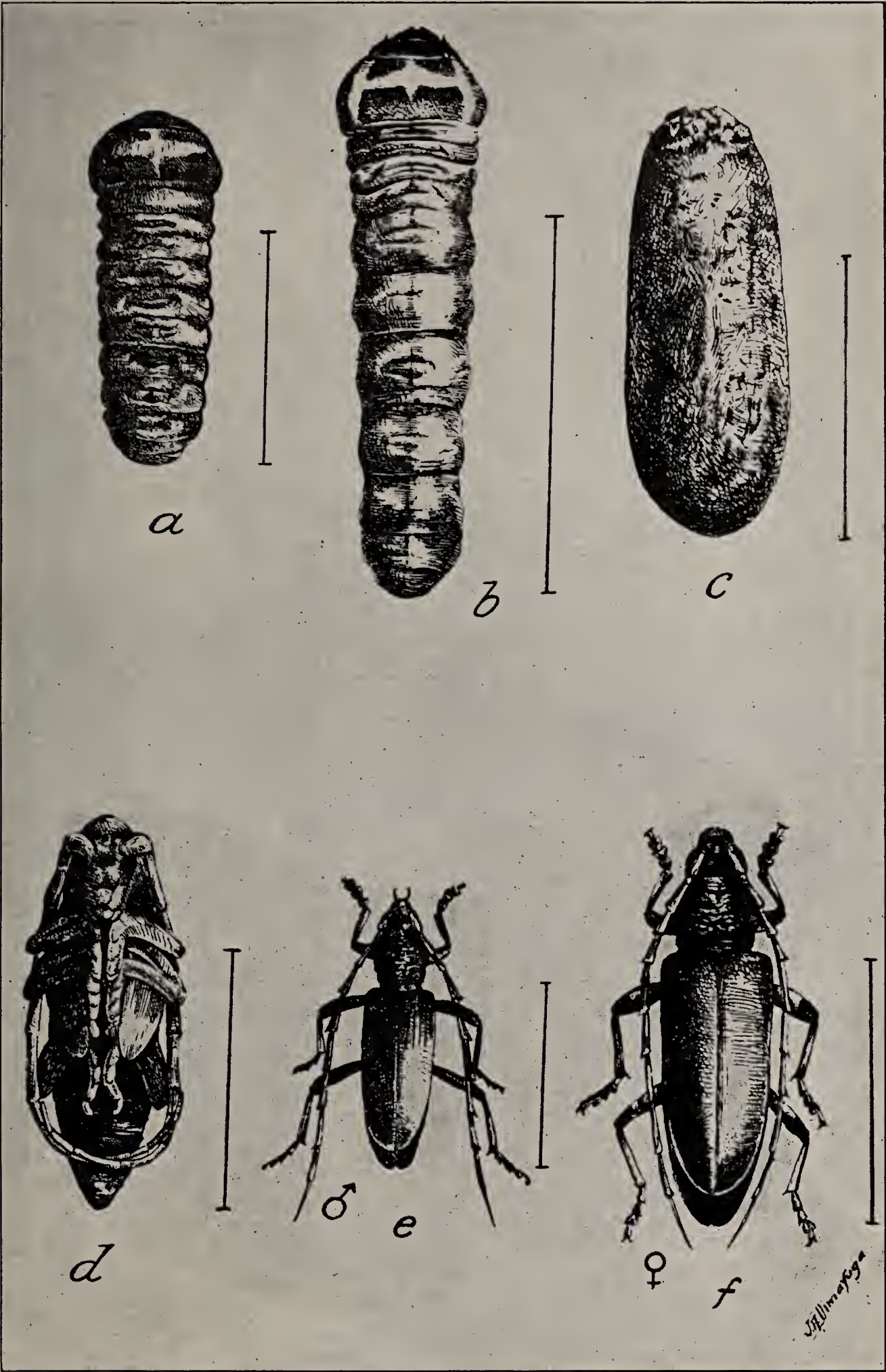
b

FIG. 72.—The mango weevil (*Sternochetus mangiferae*): a, Adult weevil, from above; b, same, from below. Much enlarged. (Marlatt.)

Distribution: Inhabits all mango regions bordering Indian Ocean, East Indies including Philippines, Madagascar, Hawaii, Labuan, Straits Settlements, and South Africa. (Text figs. 72, 73.)

VAN DINE, D. L. Agr. Exper. Sta. Hawaii, Press Bul. 17, 1906.

MARLATT, C. L. U. S. Dept. Agr., Bur. Entom., Circ. 141, 1911.



A DESTRUCTIVE MANGO INSECT.

Mango bark borer (*Plocæderus ruficornis*): a, b, Larvæ; c, cocoon; d, pupa; e, male; , female.
(Jones.)

Dacus rarotongæ Froggatt.

(Raratonga Fruit Fly. Trypetidæ; Diptera.)

Host: Mango.*Injury:* Larvæ feed in fruit.*Description:* Adult female length 9 mm., thorax shining black; wings hyaline; abdomen diamond shaped; anal segment and ovipositor yellow.*Distribution:* Raratonga, Cook Islands.

FROGGATT, W. W. Proc. Linn. Soc. New South Wales, 1910, vol. 35, pt. 4, p. 872.

Dacus tongensis Froggatt.

(Tonga Fruit Fly. Trypetidæ; Diptera.)

Host: Mango.*Injury:* Bred from mangos imported into New Zealand.*Description:* Adult female length 9 mm.; head dull yellow; thorax black, no yellowFIG. 73.—The mango weevil (*Sternochetus mangiferæ*): a, Larva; b, pupa. Much enlarged. (Marlatt.)

on shoulders; wings hyaline, nervures chocolate brown; abdomen black, elongate, oval; legs light yellow, sometimes clouded at apex of femora.

Distribution: Tonga.

FROGGATT, W. W. Proc. Linn. Soc. New South Wales, 1910, vol. 35, pt. 4, p. 870.

B. IMPORTANT MANGO INSECTS.**HEMIPTERA.****Coccidæ:****Armored—***Aspidiotus (Chrysomphalus) personatus* Comstock; West Indies, Mexico. (See Olive.)*Aspidiotus (Morganella) longispina* Morgan; Hawaii, Mauritius; scale of adult female less than 1 mm. wide, circular, flattened with reddish nipple-like exuvium.

Coccidæ--Continued.**Armored--Continued.**

- Aspidiotus (Morganella) maskelli* Cockerell; Hawaii, Mauritius, Brazil; scale of female about 1 mm. in diameter, pitch black exuvia concolorous and to one side.
- * *Aspidiotus (Pseudaonidia) articulatus* Morgan; British West Indies. (See Coffee.)
- Aspidiotus (Pseudaonidia) clavigera* Cockerell; Hawaii. (See Citrus.)
- Aspidiotus (Pseudaonidia) trilobitiformis* Green; German East Africa, Java. (See Citrus.) (See text fig. 32.)
- Aspidiotus (Pseudischnaspis) longissima* Cockerell; Mexico; scale of female 2.5 mm. long by 0.66 mm. broad, black marked with brown, ventral scale thin, white, exuvia to one side.
- Aulacaspis cinnamomi* Newstead; Java, Ceylon; scale of adult female 1.25 mm. long, 1.75 mm. broad circular, flat, thin, opaque, white.
- Chionaspis vitis* Green; India; scale of adult female 2.5 mm. long, 2.5 mm. wide, white, thin, transparent.
- * *Leucaspis indica* Marlatt; has been imported from India and is now established in certain sections of Florida. Scale of female white, elongate narrow, convex, flattened at tip; adult inclosed within swollen strongly chitinated second stages. (See plate I, fig. 1.)
- * *Parlatoria pseudaspidiotus* Newstead; has been found on mangos imported from India, also reported from Singapore. Scale of female 1.5 mm. long, 1.25 mm. broad, dark brown, usually with slight apical extension.
- Chionaspis (Phenacaspis) dilatata* Green; Ceylon; scale of female 2 mm. in length, 1.5 mm. in breadth, snow white, opaque, with irregular raised lines on dorsal surface.
- Chionaspis eugeniæ* Maskell; Orient; scale of female 2.5 mm. long, white, elongate pyriform and flat.
- Chionaspis (Phenacaspis) natalensis* Cockerell; Natal; scale of female pyriform, about 3 mm. long, white with exuviae pale orange brown, scale of male feebly tricarinate.

Unarmored--

- Ceroplastes rubens* Maskell; Australia, Hawaii, Japan. (See Avocado.)
- Ceroplastes vinsonii* Signoret; Mauritius; female covered with wax and resembles *C. rusci*.
- Coccus acuminatus* Signoret; Hawaii, Ceylon; adult female 3-3.25 mm. in length, flat pale green, acuminate at cephalic extremity and broadly rounded posteriorly.
- Coccus acutissimus* Green; Ceylon; adult female 5-6 mm. long, 1-1.5 mm. broad, long and narrow; acutely pointed at each end; color varying from creamy white to deep chocolate brown in older specimens.
- * *Coccus mangiferae* Green; West Indies, Ceylon; adult female 3-4 mm. in length, 2.5-3.5 mm. in breadth deltoid, pale yellowish green. Has been introduced into Florida and gives promise of being a serious pest.
- Geococcus radicum* Green; Ceylon, Hawaii; liable to be introduced on roots. Adult female inclosed in a brittle white sac, broadly fusiform, narrow at both extremities; antennae 6-jointed.
- Icerya minor* Green; Bengal; adult female 4-6 mm. in length, yellow, with 22 or 23 waxy patches around body and a dorsal patch of about 16.
- Icerya seychellarum* Westwood; Seychelles. (See Citrus.)
- Phenacoccus iceryoides* Green; India, Philippines; adult female usually to be found at anterior extremity of a globose ovisac, margin with conspicuous fringe of white waxy tissues.
- Phenacoccus mangiferae* Green; Ceylon, India; female pale yellow, dorsal area covered with white mealy powder, with stout white processes on margin.
- Pulvinaria ficus* Hempel; Brazil.
- Pulvinaria mammeæ*, Maskell; Hawaii; adult female reddish brown covered with thin grayish meal, ovisac large, snow white, forming a mass of loose cotton.
- Saissetia psidii* Green; Ceylon; adult female bright red to deep brown, length 2.5-3.75 mm.
- Saissetia punctilifera* Green; Ceylon; adult female 3-3.75 mm. long, 2-2.5 mm. broad, irregularly oval, narrowed in front, varying from reddish green to reddish ochreous.
- Vinsonia stellifera* Westwood; Ceylon. (See Coffee.)

THYSANOPTERA.

- * *Heliothrips rubrocinctus* Giard; West Indies, Ceylon, Uganda, Florida. (See Fruit.)

COLEOPTERA.**Cerambycidæ.**

- Epepeotes luscus* Fabricius; Java; bark borer.
- Batocera titana* Thomson; India; bores in sapwood. (See text fig. 74.)

Brachyrhinidæ.

- Diaprepes abbreviatus* Linnaeus; West Indies. (See Sugar cane.)

Curculionidæ.

- Cytorhynchus frigidus* Fabricius; India; breeds in fruit.

LEPIDOPTERA.**Notodontidæ.**

- Stauropus alternus* Walker; India, Ceylon, Java; defoliator.

DIPTERA.

Trypetidae.

Anastrepha fraterculus Wiedemann. (See Fruit.)

Dacus passifloræ Froggatt; Fiji. (See Fruit.)

Dacus persicæ Rig; India. (See Fruit.)

Dacus ferrugineus Fabricius; India. (See Fruit.) (See fig. 75.)

Dacus diversus Coquillett; India. (See Fruit.)

Bactrocera tryoni Froggatt; Orient. (See Fruit.)

Bactrocera zonatus Saunders; fruit fly; Solomon Islands, Ceylon, India.

Ceratitis capitata Wiedemann. (See Fruit.)

Ceratitis punctata Wiedemann; Africa. (See Fruit.)

LITERATURE.

FROGGATT, W. W. Proc. Linn. Soc. New South Wales, 1910, vol. 35, pt. 4, pp. 868-870.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

MAPLE.

(*Acer* spp. Family Aceraceæ.)

A large genus of trees and shrubs occurring in Europe, Asia, and America, much prized for cultivation as shade trees and valuable for lumber.

IMPORTANT MAPLE INSECTS.

ACARINA.

Eriophyidae.

Eriophyes macrochelus Nalepa; blister mite; England; attacks leaves of *Acer campestre*.

FIG. 74.—Mango borer (*Batocera titana*): Male. (Stebbing.)

HEMIPTERA.

Coccidae.

Armored—

Chionaspis salicis Linnæus; Europe; *Acer campestre* and *A. pseudoplatanus*.

Unarmored—

Eriococcus aceris Signoret; Europe; *Acer campestre*, *A. pseudoplatanus*.

Lecanium aceris Curtis; Europe.

Lecanium coryli Linnæus; Europe; *Acer campestre*, *A. negundo*, *A. platanoides*, *A. pseudoplatanus*.

Palæococcus fuscipennis Burmeister; Europe.

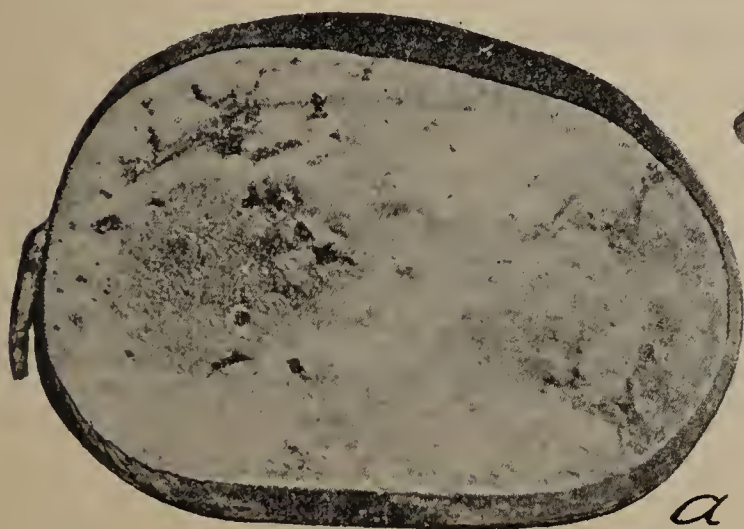
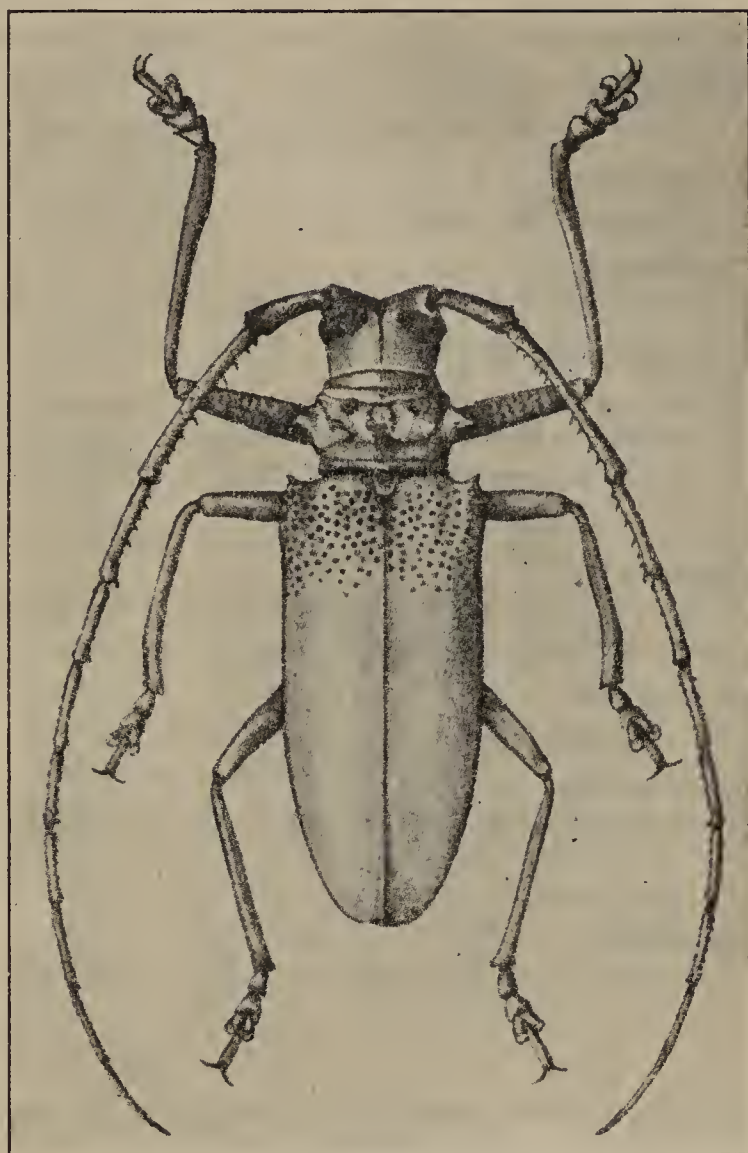


FIG. 75.—Mango fruit fly (*Dacus ferrugineus*): a, Injured mango; b, adult, and c, larva. (Maxwell-Lefroy.)

COLEOPTERA.

Anobiidæ.

Xestobium rufovillosum DeGeer; Europe; bores in trunks.

Ptilinus pectinicornis Linnæus; Europe; bores in trunks.

Lymexylonidæ.

Hylecætus dermestoides Linnæus; Germany; bores in wood.

Buprestidæ.

* *Agrilus viridis* Linnæus; Europe; bores in stems and branches. (See Oak.)

Scarabæidæ.

Melolontha hippocastani Fabricius and *M. melolontha* Linnæus; Europe; injure roots of seedlings.

Cerambycidæ.

Rhopalopus insubricus Germar; Europe; bores in bark and wood.

Scolytidæ, Ipidae.

Scolytus aceris Knotek; Bosnia; galleries in bark and sapwood.

Anisandrus dispar Fabricius; Germany; ambrosia beetle in wood.

Xyloterus domesticus Linnæus and *X. signatus* Fabricius; ambrosia beetle Germany.

LEPIDOPTERA.

Cossidæ.

Cossus cossus Linnæus; Europe; bores in wood. (See Willow.)

* *Zeuzera pyrina* Linnæus; Europe; bores in wood. (See Horse-chestnut.)

Geometridæ.

Cheimatobia brumata Linnæus; Europe; defoliator.

Lymantriidæ.

Dasychira pudibunda Linnæus, * *Euproctis chrysorrhœa* Linnæus, * *Lymantria monacha* Linnæus, * *Porthetria dispar* Linnæus, and *Porthesia similis* Fuessly; Europe; defoliators. (See Forest defoliators.)

Nepticulidæ.

Nepticula sericopeza Zeller; Germany; attacks leaves and seed.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

HESS, R. Der Forstschutz, 1898, 1900.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

MELON.

(See Cucurbits.)

MESQUITE; ALGAROA.

(*Prosopis* spp. Family Leguminosæ.)

Tender trees and shrubs growing in arid regions. Several species are native in the Southwestern United States. The pods are eaten by cattle.

IMPORTANT MESQUITE INSECTS.

HEMIPTERA.

Coreidæ.

Ceratopachys variabilis Dall., a sucking bug; India; sucks juices of jhand (*Prosopis spicigera*).

COLEOPTERA.

Bostrychidæ.

Sinoxylon crassum Lesne and *S. anale* Lesne; India; bores in *Prosopis spicigera*.

LITERATURE.

STEBBING, E. P. A Manual of Forest Zoology for India, 1908.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

MILLET.

(*Panicum miliaceum* Linnæus. Family Gramineæ.)

These are numerous varieties and species of millets grown throughout the world. This species is cultivated extensively in China, Japan, and Russia. The main danger of importing pests in shipments of seed. Its pests are discussed under Grains and Grasses.

MOUNTAIN ASH; ROWAN TREE.

(*Sorbus* spp.)

Ornamental deciduous trees of the Northern Hemisphere, with small red berries. The berries of some species are edible, and the wood is used for tool handles and similar small articles.

IMPORTANT MOUNTAIN-ASH INSECTS.**COLEOPTERA.****Scarabæidæ.**

Melolontha hippocastani Fabricius and *M. melolontha* Linnæus; Europe; larvæ injure roots of seedlings.

Curculionidæ.

Magdalis barbicornis Latreille; Europe; breeds under bark.

Scolytidæ, Ipidæ.

Scolytus mali Bechst. and *S. rugulosus* Ratzeburg Europe; bark beetles.

Xyloterus domesticus Linnæus; Germany; Ambrosia beetle.

LEPIDOPTERA.**Cossidæ.**

* *Zeuzera pyrina* Linnæus; Europe; bores in wood. (See Horse-chestnut.)

Geometridæ.

Hibernia defoliaria Linnæus; Europe; defoliator.

Lymantriidæ.

* *Lymantria monacha* Linnæus, **Orgyia antiqua* Linnæus, and *Porthesia similis* Guessly; Europe defoliators. (See Forest defoliators.)

Hyponomeutidæ.

* *Argyresthia conjugella* Zeller; Europe, Japan, British Columbia; bores in fruit. (See Apple.)

HYMENOPTERA.**Tenthredinidæ.**

Nematus septentrionalis Linnæus; Europe; sawfly.

Priophorus padi Linnæus; Europe. (See Plum.)

Collimonidæ.

Megastigmus brevicaudus Ratzeburg, a chalcid; Europe; breeds in seed.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

MOUNTAIN EBONY.

(*Bauhinia racemosa*, etc. Family Leguminosæ.)

Very showy plants of the Tropics. Many species are imported into Florida and California.

IMPORTANT BAUHINIA INSECTS.**COLEOPTERA.****Mylabridæ (Bruchidæ).**

Caryoborus gonagra Fabricius; India; Breeds in the pods of *Bauhinia racemosa*.

LITERATURE.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

MULBERRY.(*Morus* spp. Family Moraceæ.)

Trees of the temperate regions of the Old and New World. Some species produce delicious fruit, while others are cultivated for hedges or as food for silk worms.

IMPORTANT MULBERRY INSECTS.**HEMIPTERA.****Coccidæ:**

Unarmored—

Ceroplastes rusci Linnæus; Italy.*Guériniella serratulæ* Fabricius; Italy.**COLEOPTERA.****Cerambycidæ.***Apriona germari* Hope and *A. cinerea* Chevrolat; India; bore in stems of *Morus indica*.**LEPIDOPTERA.****Geometridæ.***Hemirhopala atrilineata* Butler; Japan; defoliator.*Zamacra albofasciaria* Leech; Japan; defoliator.**LITERATURE.**

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

MUSKMELON.

(See Cucurbits.)

NARCISSUS; DAFFODIL.(*Narcissus* spp. Family Amaryllidaceæ.)

Flowering plants propagated from the bulbs.

NARCISSUS INSECTS.**Merodon clavipes** Fabricius; * **Merodon equestris** Fabricius.

(Narcissus Flies. Syrphidæ; Diptera.)

Hosts: Narcissus, daffodil.*Injury:* Breeds in the bulbs.

Description and biology: *M. clavipes* black, clothed with white, yellow, red, or black hairs. * *M. equestris* black or dark metallic green, similarly clad; 13 mm. long. *Maggot* grayish yellow, 12 mm. long.

Distribution: Europe. Have been introduced into Canada, California and New Zealand.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 435.

OAK.(*Quercus* spp. Family Cupuliferæ.)

Valuable timber trees of the northern hemisphere. The bark of certain species yields cork, while of other species it is valuable for medicinal or tanning purposes.

A. BETTER KNOWN OAK INSECTS LIKELY TO BE IMPORTED.***Agrilus viridis** Linnæus.

(Flat-Headed Wood Borer. Buprestidæ; Coleoptera.)

Hosts: Oak, beech, alder, aspen, linden, birch, rose, grape, maple, pine.*Injury:* Bores in stems and branches of trees.

Description and biology: Beetle 5–8 mm. long, of variable color (olive green, blue green, blue, coppery, etc.), undersides black. Prothorax much broader than long, with median impression. Larva with first thoracic segment strongly broadened, body white. A generation requires two years.

Distribution: Europe (Austria, Germany). Introduced into eastern United States in roses.

HESS, RICHARD. Der Forstschutz, 1900, vol. 2, pp. 7, 8, figs. 2, 3.



FIG. 76.—Great oak-borer (*Cerambyx cerdo*): Adult and larva. (Nüsslin.)

***Cerambyx cerdo* Linnæus.**

(Great Oak Borer. Cerambycidae; Coleoptera.)

Hosts: Oak, cork oak, ash, walnut.

Injury: Bores in wood. (See text fig. 76.)

Distribution: Europe, Sudan, Tunis.

NÜSSLIN, OTTO: Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 145–148, figs. 115, 116.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 495–496.

***Haltica quercetorum* Foudr.**

(Oak Flea Beetle. Chrysomelidae. Coleoptera.)

Hosts: Oak, hazel, willow, birch, tea rose, beech, alder.

Injury: Feed on foliage and buds in adult and larval stage.

Distribution: Europe (Russia, Germany).

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 523.

***Cnethocampa processiona* Linnæus.**

(Oak Procession Moth. Cnethocampidæ; Lepidoptera.)

Host: Oak.

Injury: Defoliator; serious.

Description and biology: *Moth*, body clad with long hairs; forewings yellow gray with dark gray cross band; hindwings yellowish white with brown gray cross band. *Larva* gray blue with dark dorsal stripe and reddish-brown smooth spots; undersides light greenish gray. Feeds at night. In the daytime the larvæ wander in processions of a few files. *Pupation* takes place in thick oval brown cocoon. *Eggs* are laid in clusters of 100 to 200, covered with scales from the parent, and placed on smooth spots of the bark.

Distribution: Europe.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 326-328, figs. 280, 281.

***Coleophora lutipennella* Zell.**

(Oak Bud Moth. Elachistidæ; Lepidoptera.)

Host: Oaks and possibly birch.

Injury: Attacks the buds.

Description and biology: *Adult*, moth, wing expanse 15 mm., with front wings yellow, hind wings gray, all fringed. *Larva*, gray with black head. Attacks especially the axillary buds. *Pupates* in a sack or case.

Distribution: Germany.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, p. 433.

***Tortrix viridana* Linnæus.**

(Green Oak Tortrix. Tortricidæ; Lepidoptera.)

Hosts: *Quercus pedunculata*, *Q. sessiliflora*, *Castanea vulgaris*.

Injury: Feeds on the buds, foliage, and inflorescence.

Description and biology: *Moth*, wing expanse 18-22 mm., forewings brilliant green with yellowish border, hind wings gray. *Larva*, dirty green, punctured with black, with black head, 15 mm. long. *Eggs* are laid on the buds. The larva rolls the leaves, in which it feeds.

Distribution: Europe.

HESS, RICHARD. Der Forstschutz, 1900, vol. 2, pp. 128-130, figs. 66, 67.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, pp. 403, 404, fig. 332.

B. IMPORTANT OAK INSECTS.

HEMIPTERA.

Aphididæ.

Pterochlorus exsicicator Altum, *Stomaphis longirostris* Altum, and *S. quercus* Linnæus, plant lice; Europe; attack the bark, especially of the roots.

Coccidæ.

Armored—

Aspidiotus (Targionia) alni Marchal; Austria; *Quercus cerris*.

Aspidiotus (Targionia) distincta Leonardi; Italy; *Quercus robur*, *Q. suber*.

Aspidiotus (Targionia) vitis Signoret; Italy, Sardinia; *Quercus macedonica*, *Q. suber*.

Aspidiotus minimus Leonardi; Europe; *Quercus coccifera*, *Q. ilex*, *Q. suber*.

Aspidiotus (Diaspidiotus) zonatus Frauenfeld; Europe; *Quercus cerris*, *Q. lusitanica*, *Q. montana*, *Q. nigra*, *Q. pilustris*, *Q. pubescens*, *Q. robur*, *Q. sessiliflora*.

Chionaspis salicis Linnæus; Europe; *Quercus ilex*, *Q. robur*.

Coccidæ—Continued.

Unarmored—

- * *Asterolecinium viriosum* Ratzeburg; Eastern United States, Europe; *Quercus branti*, *Q. cerris*, *Q. ilex*, *Q. macdonica*, *Q. palustris*, *Q. prinus*, *Q. pubescens*, *Q. robur*, *Q. sessiliflora*, *Q. toza*, *Q. castaneifolia*, *Q. coccifera*.
Eriococcus aceris Signoret; Austria; *Quercus sessiliflora*.
Kermes bacciformis Leonardi; Europe; *Quercus cerris*, *Q. suber*.
Kermes ballotæ Signoret; Algeria, France; *Quercus ilex ballota*.
Kermes cordiformis Lindinger; Austria; *Quercus robur*.
Kermes gibbosus Signoret, Austria; *Quercus cerris*.
Kermes ilicis Linnæus; Europe; *Quercus coccifera*, *Q. ilex*.
Kermes pallidus Signoret; Europe.
Kermes roboris Fourcroy; Europe; *Quercus cerris*, *Q. ilex*, *Q. pedunculata*, *Q. robur*, *Q. sessiliflora*.
Kermes vermilio Planchon; Europe; *Quercus coccifera*.
Lecanium ciliatum Douglas; Europe; *Quercus robur*.
Lecanium coryli Linnæus; Europe; *Quercus coccifera*, *Q. ilex*, *Q. robur*, *Q. sessiliflora*, *Q. suber*.
Lecanium pulchrum King; Europe.
Nidularia pulvinata Planchon; France, Algeria; *Quercus coccifera*, *Q. ilex*.
Palæococcus fuscipennis Burmeister; Denmark; *Quercus robur*.
Pulvinaria sericea Fourcroy; Europe; *Quercus pubescens*.

COLEOPTERA.

Anobiidæ.

- Xestobium rufovillosum* De Geer; Europe; bores in dead wood.
Ptilinus pectinicornis Linnæus; Europe; bores in the wood, injuring it for technical purposes.

Lyctidæ.

- Lyctus linearis* Goeze; Europe, South America; bores in seasoned lumber, especially in sapwood; also in barrel staves.

Bostrychidæ.

- Bostrychus capucinus* Linnæus; Europe; bores in lumber and barrel staves.
Sinoxylon perforans Schr.; Europe; bores in the branches.

Lymexylonidæ.

- Hylecætus dermestoides* Linnæus; Europe; bores in wood.
Lymexylon navale Linnæus; Europe; bores in the bark and wood.

Tenebrionidæ.

- Ptylan gibbus* Fabricius, Russia; injures the roots of seedlings.

Scarabæidæ.

- Euchirus macleayi* Ho.; India; bred from oak stem.

Buprestidæ.

- Agrilus anjustulus* Illiger, *A. elongatus* Herbst, *A. subauratus* Gebler, *A. biguttatus* Fabricius; Europe; bore in bark, bast, and sapwood.
Cirrysobothris affinis Fabricius; Europe; bores in bast and sapwood of branches and in trunks of seedlings.
Citræbus elatus Fabricius, *C. fasciatus* Villers, *C. undatus* Fabricius; Europe; attack the stems and branches, especially of cork oaks.

Elateridæ.

- Agriotes aterrimus* Linnæus, *A. lineatus* Linnæus, and *A. obscurus* Linnæus, *Athous subfuscus* Müller; *Dolopius marginatus* Linnæus; *Læon murinus* Linnæus; *Limonius æruginosus* Olivier; *Prosternon holosericeus* Olivier; *Selatosomus æneus* Linnæus; wireworms; Europe; injurious to acorns and seedlings.

Scarabæidæ.

- Melolontha hippocastani* Fabricius and *M. melolontha* Linnæus; Europe; larvæ injures roots of seedlings.

Cerambycidæ.

- Callidium æneum* DeGeer; Germany; bores in wood of felled trees and lumber.
Cerambyx cerdo Linnæus; Europe; bores in bark and wood.
Clytus tropicus Panzer; Germany; bores in wood.
Pyræhylum sanguineum Linnæus, and *Phymatodes testaceus* Linnæus; Germany; bore in wood of felled trees and lumber.
Plymatodes lividus Rossi; Germany; particularly injurious to barrel hoops and lumber.
Lophosternus hugeli Redtenbacher; India; bores in trunks of *Quercus incana*.
Paraphrus granulatus Thomson; India; bores in *Quercus ilex*.
Prionus corpulentus Bates; India; probably bores in *Quercus semicarpifolia*.
Massicus unicolor Gahan; India; bores in heartwood of *Quercus griffithii*.
Xylotrechus scabbingi Gahan; India; bores in bast and outer sapwood of *Quercus dilatata*.
Mcges marmoratus Westwood; India; on *Quercus griffithii*.

Brachyrhinidæ.

Brachyderes lusitanicus Fabricius; Europe; attacks roots of *Quercus robur*, etc.

Metallites iris Olivier; Europe; breeds at the roots.

Curculionidæ.

Curculio nucum Linnæus (*Balaninus*); Europe (see Hazel). Many other spp. *Curculio* (*Balaninus*)

Calendridæ.

Calendra sculpturata Gyllenhal; India, breeds in the acorns.

Scolytidæ, Ipidæ.

Anisandrus dispar Fabricius; Europe; galleries in wood.

Dryocoetes hewetti Stebbing; India; bores in *Quercus dilatata* and *Q. incana*.

Dryocoetes villosus Fabricius; Germany; galleries in bark.

Hylesinus crenatus Fabricius; Germany; galleries in bark.

Chramesus globulus Stebbing; India; bark and wood of *Quercus incana*.

Scolytus intricatus Ratzeburg; Europe; galleries in bark.

Xyleborus dryographus Ratzeburg and *X. monographus* Fabricius; Europe; galleries in wood.

Xyleborus improbus Sampson; India; tunnels *Quercus lamellosa*.

Xyloterus domesticus Linnæus, and *X. signatus* Fabricius; Europe; galleries in sapwood.

Platypodidæ.

Diapus capillatus Sampson; India; bores in *Quercus lamellosa*.

Diapus impressus Janson; India; bores in *Quercus incana*.

Crossotarsus fairmairei Chapuis; India, bores in *Quercus incana*.

Platypus cylindrus Fabricius; Europe; bores in staves.

Scolytoplatypidæ.

Scolytoplatypus darjeelingi Stebbing; India; tunnels timber of *Quercus lamellosa*.

LEPIDOPTERA.

Cossidæ.

Cossus cossus Linnæus, goat moth, Europe; bores in wood. (See Willow.)

Zeuzera pyrina Linnæus; Europe; bores in wood. (See Horse-chestnut.)

Geometridæ.

Anisopteryx æscularia Schiffermiller; Europe; feeds on foliage.

Cheimatobia brumata Linnæus; Europe; defoliator.

Hibernia aurantaria Esp.; *H. defoliaria* Linnæus, and *H. marginaria* Borekh.; Germany; defoliators.

Larentia dilutata Borekh.; Europe; defoliator.

Biston pomonarius Hübner; Europe. (See Fruit.)

Tineidæ.

Tischeria complanella Hübner and *T. simploniella* F. R.; Germany; leaf miners.

Lasiocampidæ.

Eriogaster lanestris Linnæus, *Lasiocampa quercus* Linnæus, and *Malacosoma neustria* Linnæus; Europe; defoliators.

Lymantriidæ.

Dasychira pudibunda Linnæus, **Euproctis chrysorrhæa* Linnæus, **Lymantria monacha* Linnæus, *Ocneria detrita* Esp., **Porthetria dispar* Linnæus, *Porthesia similis* Fuessly; Europe; defoliators. (See Forest defoliators.)

Gazalina apsara; India; defoliates *Quercus lamellosa*.

Sesiidæ.

Sesia conopiformis Esp. and *S. vespiformis* Linnæus; Europe; bore in trunk.

Tortricidæ.

Laspeyresia splendana Hübner (*Carpocapsa*); Europe; breeds in acorns. (See Chestnut.)

Laspeyresia grossana Haworth (*Carpocapsa*). (See Beech.)

Notocelia roborana Treitschke; Europe. (See Gooseberry.)

HYMENOPTERA.

Cephididæ.

Janus cynosbati Linnæus, a wood wasp mining in shoots; Europe.

Tenthredinidæ.

Macrophya punctum-album Linnæus; Russia; sawfly on foliage.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

HESS, R. Der Forstschutz, 1898, 1900.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887.

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

STEBBING, E. P. Indian Forest Insects. Coleoptera, 1914.

STEBBING, E. P. A Manual of Forest Zoology for India, 1908.

OATS.

(*Avena sativa* Linnæus. Family Gramineæ.)

This crop is grown in all temperate regions and also in Australia, Africa, and South America, the greater part of the world's crop being raised in Europe. While the United States exports more oats than it imports, the latter trade is of considerable importance and there is always danger of importing pests with the grain. A full discussion of its insect pests will be found under the heading Grains and Grasses.

OKRA.

(*Hibiscus esculentus*. Family Malvaceæ.)

A cultivated plant introduced into the United States from Africa; cultivated for its fruit pods.

IMPORTANT OKRA INSECTS.

LEPIDOPTERA.

Pyralidæ.

Sylepta derogata Fabricius; Africa, Asia.

Noctuidæ.

Cosmophila sabulifera Guénée; Africa, Asia, Hawaii.

COLEOPTERA.

Chrysomelidæ.

Diabrotica graminea Ballou; Porto Rico.

OLIVE.

(*Olea* spp. Family Oleaceæ.)

Fruit bearing trees or shrubs of the tropical and warm temperate parts of the old world to New Zealand. *Olea europæa* produces the olive prized as a fruit and for its oil. It is cultivated in California and New Mexico.

A. BETTER KNOWN OLIVE INSECTS LIKELY TO BE IMPORTED.

Aleurolobus olivinus Silvestri.

(Olive White Fly. Aleyrodidæ; Hemiptera.)

Host: Olive.

Injury: Feeds on foliage, ordinarily not serious.

Description and biology: *Adult*, male body cream-colored or whitish ocher; body and wings sprinkled with a white waxy powder, forewings exhibit fulvous spots. *Pupa case*, length somewhat exceeding width; dorsum black, margin marked with a fringe of wax. *Egg* reticulated subelliptical, attached by a short pedicel; pale straw in color when first deposited, subsequently turning to brown. One generation a year.

Distribution: Italy.

SILVESTRI, F. Dispense di Entomologia Agraria, 1911, p. 128.

Prays oleellus Fabricius.

(Olive Moth. Hyponomeutidæ; Lepidoptera.)

Host: Olives.

Injury: Serious.

Description and biology: *Adult*, moth 6-6.5 mm. long, gray with silvery reflection, a black spot on the apex of the scutellum; front wings gray with silvery reflection,

and with several black or dark spots; hind wings uniformly gray. *Pupa* obconical 5 mm. long in elongate silken cocoon. *Larva* when full grown, dusky color with two olivaceous stripes on the dorsum. In the first generation feeds on the leaves; in the next among the buds and blooms; and in the last in the fruit.

Distribution: France, Italy, Spain.

SILVESTRI, F. Bull. Lab. Zool. R. Sc. Agr. Portici, 1907, vol. 2, pp. 83-184, figs. 1-68.

Dacus oleæ Rossi.

(The Olive Fly. Trypetidæ; Diptera.)

Host: Olive (*Olea europaea*, *O. verrucosa*, *O. chrysophylla*.)

Injury: Serious pest of olive in Mediterranean regions.

Description and biology: *Adult*, female small, about 5 mm. in length; head dull yellow, eyes black, thorax black with silvery pubescence on dorsal surface forming three parallel black lines; abdomen black, covered with a scattered gray pubescence. The egg, larval, and usually the pupal stages are passed in the fruit. Occasionally pupation takes place in the soil. Larvæ hatch in from 2 to 4 days after deposition of the eggs; larval stage lasts approximately 10 to 13 days; pupal stage 13 to 49 days, depending upon the season.

Distribution: Sicily, Italy, north, east, and south Africa, Canary Islands, Mediterranean region, northern and western Asia, Himalayas, India.

SILVESTRI, F. Bull. Lab. Zool. R. Sc. Agr., Portici, 1913, vol. 8, p. 70.

B. IMPORTANT OLIVE INSECTS.

HEMIPTERA.

Coccidæ.

Armored—

Aspidiotus (Chrysomphalus) nigropunctatus Cockerell; Chili, Mexico; adult female scale 3 mm. in diameter, dirty gray; exuviae pitch black with narrow reddish margin.

Aspidiotus (Chrysomphalus) personatus Cockerell; Jamaica; adult female scale very small, convex, circular, dark gray or black.

**Aspidiotus (Pseudaonidia) articulatus* Morgan; Jamaica. (See Coffee.)

Aspidiotus (Pseudaonidia) duplex Cockerell; Italy; on *Olea fragrans*; adult female scale 2.66 mm. in diameter, subcircular, moderately convex, dark, blackish brown, exuvia to one side and of orange color.

Aspidiotus (Aonidia) oleæ Leonardi; Africa.

Lepidosaphes olivina Leonardi; Africa.

Chionaspis (Phenacaspis) bupleuri Marchal; Tunis.

Chionaspis nerii Newstead; Algeria.

Diaspis oleæ Colvée; Spain.

**Fiorinia theæ* Green; India; adult female scale elongate, narrow, dark brown with distinct dark median marking. Male scale snow white indistinctly tricarinate (see pl. V, fig. 1).

Leucaspis riccæ Targioni-Tozzetti; France, Greece, Algeria, Italy; adult female scale 2.25 mm. long, 0.5 mm. broad, narrow, white, with sides parallel.

Parlatoria affinis Newstead; Algeria; adult female scale 1-1.25 mm. in diameter, when isolated circular, dusky white or pale ochreous.

Parlatoria calianthina Berlese and Leonardi; Italy and Algeria; adult female scale 2.3 mm. long, 2.6 mm. broad, white, dorsal exuvia subcentral.

Unarmored—

Ceroplastes rusci Linnæus; Italy; adult female covered with wax, antennæ 6-jointed.

Euphilippia olivina Berlese and Silvestri; Italy.

Filippia oleæ Costa; Italy, Algeria; adult female forms a white sac in the foliage.

Lichtensia eiloni Newstead; Algeria; adult female inclosed in a felted sac; adult male scale glossy white with strong central keel.

Pollinia pollini Costa; Italy; adult female scale pale yellow to brown, smooth head, convex, with median curled flossy like filaments on the dorsum.

THYSANOPTERA.

Phlæothripidæ.

Phlæothrips oleæ Costa; Algiers, Italy, South America; attacks leaves, bloom and fruit and is an important pest in Italy according to Trabut.

COLEOPTERA.

Cerambycidae.

Vesperus mauretanicus Dry.; Algeria, Spain. (See Grape.)

Curculionidae.

Cionus, raxini De Geer; Europe; breeds on leaves.

Ipidæ.

Phloeotribus oleæ Fabricius; barkbeetle; Southern Europe; Tunis; in nursery stock.

Hylesinus fraxini Fabricius and *H. oleæ* Fabricius; Europe; breed in bark and wood.

Hylesinus vestitus M. and R.; barkbeetle; Tunis, Corsica, Italy, Southern France; in *Pistacia* and olive.

LEPIDOPTERA.

Æcophoridae.

Æcophora oliviella Fabricius; Europe; infests fruit.

LITERATURE.

TRABÜT, L. La Defense Contre les Cochenilles, 1910, p. 88.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

ONION; SHALLOT; LEEK; GARLIC.

(*Allium* spp. Liliaceæ.)

Bulbous root plants native of Asia domesticated for centuries and developed into many valuable varieties.

A. BETTER KNOWN ONION INSECTS LIKELY TO BE IMPORTED.

Chortophila cillerura Rondani.

(Shallot Fly. Anthomyidæ; Diptera.)

Hosts: *Allium* spp. (including shallot), asparagus, human excrement.

Injury: Breeds in the plant stems.

Description and biology: Male fly gray, with three brown stripes on scutellum, abdomen with deep black median stripe and brown segments; appendages black. Female lighter; length 4.5 mm. Maggot dirty white, with 14 teeth on apical margin of stigmal plate.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 427.

* **Hylemyia antiqua** Meigen.

(Onion Maggot. Anthomyidæ; Diptera.)

Host: Onions.

Injury: Serious injury to the roots.

Description and biology: Fly black, thickly dusted with gray, with dark flecks and stripes; legs piceous black; length 6.5 mm. Maggot yellowish, 5–6 mm. long.

Distribution: Europe. Introduced into United States.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 430, fig. 262.

SMITH, J. B. New Jersey Exp. Sta. 1907, Bul. 200, pp. 10–15, figs. 1, 8, 11.

* **Eumerus strigatus** Fabricius.

(Onion Fly. Syrphidæ; Diptera.)

Host: Onions, *Iris*.

Injury: Breeds in the stems and bulbs.

Description and biology: Fly green; abdomen with gray hairy lunules at apex and at sides of the first three segments; antennæ dark; length 6–7.5 mm. Maggot grayish yellow. Pupa sometimes in soil, sometimes in flower shaft.

Distribution: Europe. Reported present in this country, by Felt, from *Iris* roots at Saratoga Springs, N. Y.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 434.

B. IMPORTANT ONION INSECTS.

COLEOPTERA.

Curculionidæ.

Hypera nigrirostris Fabricius, *H. ononidis* Chevrolat; Europe. (Sec Clover.)

Brachyceridæ.

Brachycerus albidentatus Gyllenhal; Europe; breeds in roots of *Allium sativum* and *A. ascalonicum*.

Brachycerus corrosus Gyllenhal; Europe; breeds in roots of *Allium roseum*.

Brachycerus pradieri Fairmaire; Europe; breeds in roots of *Allium sphærocephalum*.

Brachycerus undatus Fabricius, breeds in roots of *Allium roseum*.

ORACHE.

(*Atriplex hortensis*. Family Chenopodiaceæ.)

Plants cultivated for their succulent vegetation.

IMPORTANT ORACHE INSECTS.

COLEOPTERA.

Chrysomelidæ.

Cassida nebulosa Linnæus. (See Beet.)

DIPTERA.

Anthomyidæ.

* *Chortophila* (*Pegomya*) *hyoscyami* Panzer. (See Beet.)

ORCHIDS.

(Family Orchidaceæ.)

Many species of orchids are imported by florists from all parts of the tropical and semitropical regions. Several important pests have been taken in quarantine.

IMPORTANT ORCHID INSECTS.

ACARINA.

Tyroglyphidæ.

Rhizoglyphus (*Coepophagus*) *echinopus* F. & R. (See Potato.)

HEMIPTERA.

Coccidæ.

Armored—

Aspidiotus (*Chrysomphalus*) *alienus* Newstead; London, England.

* *Aspidiotus* (*Chrysomphalus*) *persex* Comstock; Central America.

Aspidiotus (*Chrysomphalus*) *portoricensis* Lindinger; Venezuela.

Aspidiotus (*Diaspidiotus*) *coloratus* Cockerell; Guatemala.

* *Aspidiotus* (*Pseudaonidia*) *articulatus* Morgan; Mexico.

* *Aspidiotus* (*Targionia*) *biformis* Cockerell; Trinidad, Venezuela, Grenada, Central America, Jamaica, Antigua, Colombia.

* *Aspidiotus* (*Targionia*) *biformis* var. *cattleyæ* Cockerell; Jamaica.

Diaspis cattleyæ Cockerell; Mexico, England.

Fiorinia stricta Maskell; New Zealand.

Furcaspis oceanica Lindinger; Venezuela.

Lepidosaphes cocculi Green; Philippine Islands.

Lepidosaphes pallida Green; Java.

Parlatoria mytilaspiformis Green; Hawaii.

* *Parlatoria proteus* Curtis; India, Brazil, Japan, Philippine Islands, Burma, United States.

* *Parlatoria pseudaspidotus* Lindinger; India, Philippine Islands, Singapore. Has been introduced into the United States on mangos.

Pinnaspis longula Leonardi; Straits Settlements.

Unarmored—

Asterolecanium aureum Boisduval; Ceylon, West Indies.

Asterolecanium epidendri Bouché; Central America, South America, Samoa.

Coccus acuminatus Signoret; Hawaii.

Coccus minimus Newstead; Straits Settlements.

Pseudococcus glaucus Maskell; New Zealand.

* *Pulvinaria floccifera* Westwood; Venezuela, British Isles, Massachusetts, Indiana, California.

LEPIDOPTERA.

Castniidæ.

Castnia licus Drury; South America. (See Sugar cane.)

COLEOPTERA.

Curculionidæ.

* *Cholus forbesi* Pascoe, and * *Cholus cattleyæ* Champion have been introduced on orchids.

PALMS.

The palms yield some very important articles of commerce, such as coconuts and dates, and are also considered very valuable as ornamental plants.

For convenience the pests of the coconut palm (*Cocos nucifera*), the date palm (*Phoenix dactylifera*), the royal palm (*Oreodoxa regia*), the sago palm (*Cycas revoluta*), and the toddy palm (*Phoenix sylvestris*) are treated under this heading.

A. BETTER KNOWN PALM INSECTS LIKELY TO BE IMPORTED.

Aleurodicus destructor Mackie.

(Coconut White Fly. Aleyrodidæ; Hemiptera.)

Host: Coconut palms.

Injury: Has the appearance of being a serious coconut enemy.

Biology: Eggs are laid on undersurface of the leaflets, where the young larvæ locate. Life history much the same as *Dialeurodes citri* R. and H. (See Citrus.) (See text fig. 77.)

Distribution: Philippines.

MACKIE, D. B.: Philippine Agricultural Review, vol. 5, No. 3, 1912.

Levuana iridescens Bethune-Baker.

(The Coconut Leaf Moth. Zygaenidæ; Lepidoptera.)

Hosts: Coconut palm and royal palm (*Oreodoxa regia*).

Injury: Larvæ injurious to foliage, giving the trees a sickly appearance.

Description and biology: Adult female, head and thorax steel-blue; abdomen and legs ochreous, primary veins deep unicolorous steel-blue, secondaries iridescent steel-blue; wing expanse about 16 mm. Eggs deposited on under surface of leaflets, usually near the base. Upon hatching, which requires about 4 or 5 days, the larvæ begin feeding around the egg shell, gradually proceeding in a longitudinal line up the leaf, nibbling on the epidermal cells on the under surface of the leaflet; are full grown in 3 or 4 weeks, when they return to the base of the leaves

and construct a white cocoon within which to pupate; the adults appear in about 7 days.

Distribution: Fiji.

JEPSON, FRANK P. Dept. Agric. Fiji, Council Paper No. 25, 1911, p. 35.



FIG. 77.—Coconut white fly (*Aleurodicus destructor*): Adult white fly, enlarged, at bottom. (Mackie.)

Oryctes rhinoceros Linnæus.

(Rhinoceros Beetle. Scarabæidæ; Coleoptera.)

Hosts: Palm, aloes, sugar cane (occasionally).*Injury:* Destructive to coconut palm in Malacca, Singapore, and Madras. May be introduced in plants.*Description and biology:* *Adult beetle* large thickset, about 5 cm. long; and 25 mm. broad; color dark brown to black. The adults feed upon the soft tissues and unopened leaves of palms. *Larvæ* are found in decomposed vegetable matter and soil rich in humus about plant roots. *Pupa* is inclosed in hard case. The *eggs* are white but become dull with age; measure 3.5 mm. by 2 mm.; oval.*Distribution:* Ceylon, India, Siam, Annam, Pahang, Sumatra, Java, Celebes. Ceram, Amboina, Philippine Islands, Formosa, Korea, China, Straits Settlements, Tahiti, Madras, Malabar.

MAXWELL-LEFROY, H. Indian Insect Pests, 1906, p. 207.

MAXWELL-LEFROY, H. Indian Insect Life, 1909, p. 255.

GHOSH, C. C. Memoirs Dept. Agric. India, Entom. Ser., 1911, vol. 2, No. 10, p. 193.

Promecotheca cumingii Baly.

(The Coconut Leaf Miner Beetle. Hispidæ; Coleoptera.)

Host: Coconut (*Cocos nucifera*).*Injury:* Mines the leaves in larval stage; adults also feed on leaves. May be introduced in leaves of nursery stock.*Description and biology:* *Adult beetle* 7.5–10 mm. long and 1.6–2 mm. wide, general color, brown ocher; head small, elytral striæ finely punctate. *Eggs* deposited singly on underside of leaflets in a small hole made by the adult; entire larval and pupal periods spent in the leaf between the lower and upper epidermis. More injury is occasioned by the larva than by the adult. Tissues which have been attacked soon become brown and die. Egg stage about 32 days, and pupal stage about 7.5 days.*Distribution:* Philippine Islands.

JONES, CHAS. R. The Philippine Agric. Review, 1913, vol. 6, No. 5, p. 228.

Promecotheca reichei.

(Coconut Leaf Miner. Hispidæ; Coleoptera.)

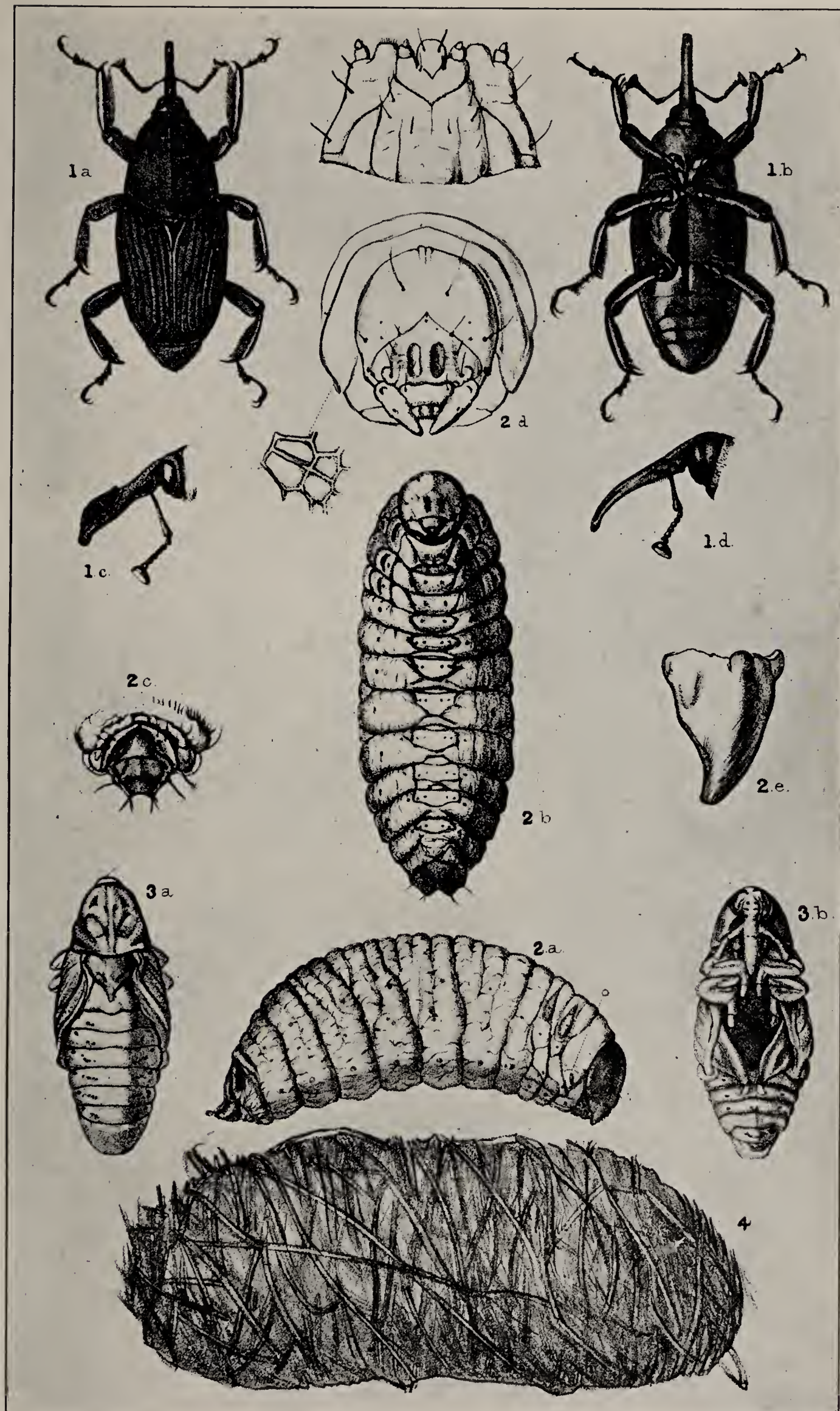
Host: Coconut palm.*Injury:* Damage occasioned by the pest is usually local, but affected trees appear brown and unhealthy when viewed from a distance.*Description and biology:* *Adult beetle* length 8 mm., breadth 2 mm.; general color golden; head quadrangular in shape and provided with powerful mandibles; thorax golden, basal third of elytra golden and remainder metallic blue. *Eggs* are deposited singly on under surface of leaflets; larvæ on hatching make their way into the leaf and tunnel between the upper and lower surfaces, feeding on the fleshy cells; pupate usually at extreme end of tunnel passage; pupal stage lasts from 18 to 20 days.*Distribution:* Fiji.

JEPSON, FRANK B. Dept. Agric. Fiji, Council Paper No. 25, 1911, p. 39.

Brontispa froggatti Sharp.

(The Leaf Hispa. Hispidæ; Coleoptera.)

Host: Coconut palm.*Injury:* Very injurious to young coconut groves in Solomon Islands. Liable to be imported on growing plants.



A PALM WEEVIL.

The palm weevil (*Rhynchophorus palmarum*): 1 a-d, Adult; 2 a-e, larva; 3 a, b, pupa; 4, cocoon. (Blandford.)



THE PALM SCALE.

*The palm scale (*Phenacoccus marlatti*). (Original, Sasser.)

Description and biology: Adult beetle about 12 mm. long from tip of antennæ to tip of abdomen, shining black, head small, antennæ 11-jointed, thorax almost square, slightly hollowed on sides. Eggs deposited in the folds of the opening fronds. Larvæ feed on surface of leaf and the adult also injures the foliage.

Distribution: New Britain and Solomon Islands.

FROGGATT, W. W. Dept. Agric. New South Wales, Science Bul. 2, 1912, p. 24.

***Rhynchophorus ferrugineus* Fabricius (*signaticollis* Chevrolat).**

(Red Palm Weevil. Calendridæ; Coleoptera.)

Hosts: Coconut palm (*Cocos nucifera*), toddy palm (*Phoenix sylvestris*), and date palm (*Phoenix dactylifera*).

Injury: Destructive to palms in India, Straits Settlements, and Ceylon. Liable to be introduced in plants.

Description and biology: Adult weevil, brown with conspicuous curved beak; about 37 mm. long. Eggs laid singly in tissues of palm tree. Larvæ on hatching tunnel in the soft tissues, gradually working into the stem; pupate in a cocoon of twisted fibers within the plant. (See text fig. 78.)

Distribution: India, Ceylon, Straits Settlements, Andaman Islands, Persian Gulf, Philippine Islands.

MAXWELL-LEFROY, H. Indian Insect Pests, 1906, p. 208.

STEBBING, E. P. Indian Forest Pests, Coleoptera, 1914, pp. 444, 445; figs. 292, 293.

FROGGATT, W. W. Dept. Agric., New South Wales, Science Bul., 2, p. 19, August, 1912.

BANKS, CHARLES S. The Principal Insects Attacking the Coconut Palm, 1906, Pts. I and II, p. 154.

GHOSH, C. C. Mem. Dept. Agric. India, Entom. Ser., 1911, vol. 2, No. 10, p. 205.

***Rhynchophorus palmarum* Linnæus.**

(The Palm Weevil. Calendridæ; Coleoptera.)

Hosts: Palm and sugar cane.

Injury: Reported to be very serious in British Honduras.

Description and biology: A very large reddish weevil. Eggs are deposited in tissues of food plant; larva spends entire existence as a borer, and when full grown pupates in a rough cocoon constructed of fibers without leaving the plant. (See plate xxxi.)

Distribution: British Honduras, Trinidad, Lesser Antilles, Brazil, Cayenne, Surinam, and possibly generally distributed over tropical coast of South America and Central America.



FIG. 78.—Red palm weevil (*Rhynchophorus ferrugineus*): Adults, cocoon. (Maxwell-Lefroy.)

CHITTENDEN, F. H., U. S. Dept. Agr., Bur. Entom., Bul. 38, 1902, pp. 23-25.

URICH, F. W. Bull. Dept. Agric. Trinidad and Tobago, 1912, vol. 11, p. 70.

BALLOU, H. A. Insect Pests of the Lesser Antilles, 1912, p. 107.

BLANDFORD, WALTER F. H. Kew Bulletin, February-March, 1893, pp. 27-60.

B. OTHER IMPORTANT PALM INSECTS.

HEMIPTERA.

Coccidæ.

Armored—

Aspidiotus pangoensis D. & F.; Samoa; coconut husks.

Aspidiotus (Pseudaonidia) articulatus Morgan; Brazil, West Africa, Venezuela, Mexico; coconut. (See Coffee.)

Aspidiotus (Pseudaonidia) trilobitiformis Green; West Africa, German East Africa, Japan, Venezuela, Brazil; coconut, sago palm. (See text fig. 32.)

Aspidiotus (Pseudischnaspis) linearis Hempel; Brazil.

Aspidiotus (Hemiberlesia) palmæ Morgan and Cockerell; East and West Africa, West Indies, Azores, Brazil; coconut.

Aspidiotus (Hemiberlesia) simillimus Cockerell; Australia.

**Aspidiotus (Chrysomphalus) perseæ* Comstock; Florida, Mexico, Brazil; coconut. (See Avocado.)

Aspidiotus (Chrysomphalus) personatus Comstock; British Guiana, Porto Rico, Mexico; coconut. (See Olive.)

Aspidiotus (Chrysomphalus) propinquus Banks; Philippines.

Aspidiotus (Chrysomphalus) scutiformis Cockerell; Central America.

Aspidiotus (Chrysomphalus) ansei Green; Seychelles; *Cocos nucifera*.

Aspidiotus fissidens var. *pluridentatus* Lindinger; German East Africa.

Aspidiotus (Diaspidiotus) orientalis Newstead; German East Africa.

Aspidiotus spinosus Comstock; Italy, German East Africa, Brazil.

Aspidiotus varians Lindinger; German East Africa, Madagascar.

Chionaspis inday Banks; Philippines.

Chionaspis substriata Newstead; Uganda, British East Africa.

Chionaspis samoana D. & F.; Samoa.

Cryptaspis nucum Lindinger; Madagascar.

**Diaspis zamix* Morgan; Germany, Colorado, Wisconsin (in greenhouses), Italy.

Furcaspis oceanica Lindinger; Caroline Islands.

Lepidosaphes mcgregori Banks; Philippines.

Lepidosaphes unicolor Banks; Philippines.

Lepidosaphes duponti Green; Seychelles; *Cocos nucifera*.

Leucodiaspis cockerelli de Charmoy; German East Africa, Brazil, Venezuela.

Parlatoria blanchardii Targioni-Tozzetti; Australia, Algeria, Sahara, Egypt, Arabia; date palm. (See pl. 5, fig. 3.)

Parlatoria greeni Banks; Philippines.

**Parlatoria proteus* Curtis; Brazil, Jamaica, Australia.

Parlatoria mytilaspiformis Green.

Chionaspis (Phenacaspis) cockerelli Cooley; China; sago palm.

Chionaspis (Phenacaspis) dilatata Green; India. (See Mango.)

Pinnaspis buri Bouché; British Guiana, Trinidad, West Indies, Togoland, German East Africa; coconut. (See Betel nut.)

**Poliaspis cycadis* Comstock.

Unarmored—

Asterolecanium ceriferum Green; Ceylon.

Asterolecanium lineare Lindinger; Brazil.

Asterolecanium palmæ Cockerell.

Asterolecanium urichi Cockerell.

Asterolecanium hilli Green; Australia; *Livistona humulis*.

Ceroplastes actiniformis Green; Ceylon.

Ceroplastes myricæ Linnæus; South Africa, India, Europe (in greenhouses).

Ceroplastes rubens Maskell; Australia, Hawaii, Japan.

Coccus hesperidum Linnæus; cosmopolitan; tea, citrus, palms (see pl. II, fig. 4).

Coccus acutissimus Green; Ceylon; coconut, sago.

Dactylopius coccus Costa; Canary Islands.

Halimococcus lampas Cockerell.

Icerya montserratensis Riley and Howard; West Indies, Grenada, Mexico. (See Citrus.)

Icerya seychellarum Westwood. (See Citrus.)

Lecanium pseudolepansum Green; Australia; *Pandanus odoratissimus*.

Paralecanium cocophyllæ Banks; Philippines.

**Phænicococcus marlatti* Cockerell; Algeria, Egypt, Sahara; date palm. (See pl. XXXII.)

Coccidæ—Continued.**Unarmored—Continued.***Pseudococcus cocotis* Maskell; Guam.*Pseudococcus dubia* Newstead; Barbados, Grenada.*Pseudococcus pandani* Cockerell; Fiji; coconut.*Pseudococcus virgatus* Cockerell; Jamaica, Mexico; coconut.*Rhizæcus falcifer* Künckel; Algeria, Sicily.*Rhizæcus* (?) *terrestris* Newstead; London (greenhouse).*Ripersia palmarum* Ehrhorn; Hawaii; *Cocos nucifera*, *Areca lutescens*.**COLEOPTERA.****Calendridæ.***Rhabdocnemis obscurus* Boisduval; Hawaii, etc. (See Sugar Cane.)**LEPIDOPTERA.****Pyralidæ.*** *Ephestia cautella* Walker; Egypt; breeds in half ripe dates. (Gough, L. H.: The Agric. Journ. Egypt, vol. 3, 1914, pp. 104-105.)**Lycaenidæ.***Virachola livia* Klug; Egypt; breeds in dates (Gough, l. c., p. 105).**Tineidæ.***Ereunetis flavistriata* Walsingham; Hawaii. (See Sugar Cane.)**Zygænidæ.***Levuana iridescent* Bethune-Baker; Fiji. (See Royal palm.)**PANAMA RUBBER.**

(Castilloa elastica. Family Moraceæ.)

African, Mexican, and Central American trees yielding rubber.

A PANAMA-RUBBER INSECT LIKELY TO BE IMPORTED.*Inesida leprosa* Fabricius.

(Castilloa Borer. Cerambycidæ; Coleoptera.)

Host: Panama rubber (*Castilloa elastica*).*Injury:* Very serious borer. In West Africa it has almost ruined Castilloa culture.*Description and biology:* Beetle brown, venter and greater part of elytra covered with yellowish brown scales; a black triangle on lateral margin of each elytron beyond middle; humeri of elytra strong and coarsely punctured; length 25-35 mm. *Larva* 5 cm. long, with large clypeus. *Eggs* laid at base of trunk. Pupates in larval tunnel.*Distribution:* West and East Africa.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 502, 503.

PAPAYA.

(Carica papaya. Family Passifloraceæ.)

A tropical fruit-bearing tree grown in Florida.

IMPORTANT PAPAYA INSECTS.**HEMIPTERA.****Coccidæ.***Aspidiotus destructor* Signoret; Amani, Africa.*Pseudoparlatoria ostriata* Cockerell; Cuba.**COLEOPTERA.****Calendridæ.***Rhabdocnemis obscurus* Boisduval. (See Sugar cane.)**DIPTERA.****Trypetidæ.***Ceratitis capitata* Wiedemann; attacks *Carica papaya* and *C. quercifolia*. (See Fruit.)* *Toxotrypana curvicauda* Gerstaecker; papaya fruit fly; West Indies, Florida (F. Knab and W. W. Yothers, Journ. Agr. Res., vol. 2, pp. 447-453, 2 plates.

PARA PLUM.

(*Spondias* spp. Family Anacardiaceæ.)

AN IMPORTANT PARA-PLUM INSECT.

DIPTERA.

Trypetidæ.

Anastrepha fraterculus Wiedemann. (See Fruit.)

PARA RUBBER.

(*Hevea brasiliensis* Muell. Family Euphorbiaceæ.)

This tree produces the Para rubber of commerce, or caoutchouc. It grows in Brazil and Guiana, and attempts have been made to grow it in Florida.

IMPORTANT PARA-RUBBER INSECT.

ISOPTERA.

Termitidæ.

Coptotermes gestroi Wasmann, white ant; India; destroys the roots.

PARSLEY.

(*Carum petroselinum*. Family Umbelliferæ.)

An herb cultivated for its foliage, much used as a garnish.

AN IMPORTANT PARSLEY INSECT.

LEPIDOPTERA.

Pyalidæ.

* *Pionea ferrugalis* Hübner; Europe, Asia, North America. (See Cabbage.)

PARSNIP.

(*Pastinaca sativa* Linnæus. Family Umbelliferæ.)

The parsnip is grown in Europe and America, and, being a root crop, is liable at any time to introduce root pests.

IMPORTANT PARSNIP INSECTS.

ACARINA.

Tyroglyphidæ.

* *Rhizoglyphus* (*Coepophagus*) *echinopus* F. and R. (See Potato.)

LEPIDOPTERA.

Gelechiidæ.

Depressaria nervosa Hw. and *D. depressella* Hübner; Europe; attack buds and flower heads.

DIPTERA.

Agromyzidæ.

Phytomyza affinis Fallen. (See Tobacco.)

Trypetidæ.

Acidia heraclei Linnæus; Europe. (See Celery.)

PEA.

(*Pisum sativum*. Family Leguminosæ.)

The various varieties of peas are grown extensively in Europe and America. Some of the pests of the peas, such as the weevils, have been very widely distributed by commerce. (See Bean.)

A. BETTER KNOWN PEA INSECTS LIKELY TO BE IMPORTED.* *Etiella zinckenella* Treitschke.

(Pea Pod Borer. Pyralidæ; Lepidoptera.)

Hosts: Peas, bean, Sann hemp (*Crotalaria*).*Injury:* Breeds in the pods.*Description and biology:* *Adult*, moth with wing expanse 18-30 mm., pale rufous; forewings gray brown, with white marginal fascia and a transverse rufous bar, hind-wing with brown suffusions and lines. *Pupa* in spindleform cocoon. *Larva* bores in the pods of legumes.*Distribution:* Europe, Africa, Asia, West Indies, California, Colorado, Texas, Florida, Oklahoma, nearly cosmopolitan.

MAXWELL-LEFROY, H. M. Mem. Dept. Agric. India, vol. 1, 1907, p. 204.

CHITTENDEN, F. H. U. S. Dept. Agr. Bur. Entom., bul. 82, pp. 25-28, 1909.

Laspeyresia (*Grapholitha*) spp.

(Pea Moths. Tortricidæ; Lepidoptera.)

Species: *L. dorsana* Fabricius; Europe; peas, beans, *Orobis tuberosus*, and *Trifolium pratense*. *L. nebritana* Treitschke; Sudan; lentils, field peas, wild legumes. **L. nigricana* Stephens; Europe and Canada since 1893; peas.*Injury:* Bore in the pods.*Description and biology:* *Moths*, brownish; *dorsana* with crescentiform white spots on forewings; *nigricana* a little smaller than *nebritana*, the latter with two curved lines near tip on each forewing. Larvæ bore in pods.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 281, 282, 283, figs. 205-206.

Contarinia pisi Winn.

(Pea Midge. Itonididæ [Cecidomyiidæ]; Diptera.)

Hosts: Pea.*Injury:* Breeds in the hulls of peas, impairing or destroying the yield.*Description:* *Midge*, yellow, thorax banded with brown, antennæ black; length 2 mm. *Maggot* white, 3 mm. long.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 446, 447.

B. OTHER IMPORTANT PEA INSECTS.

HEMIPTERA.

Aphididæ.* *Macrosiphum pisi* Kaltenbach.

COLEOPTERA.

Elateridæ.*Agriotes lineatus* Linnæus. (See Tobacco.)**Mylabridæ (Bruchidæ).*** *Mylabris rufimanus* Boheman, California, * *M. pisorum* Linnæus, *M. lentis* Frölich, *M. pallidicornis* Boheman, * *Acanthoscelides obtectus* Say, * *Pachymerus chinensis* Linnæus, * *P. quadrimaculatus* Fabricius; attack seed. (See Beans.)**Curculionidæ.***Sitona lineata* Linnæus, * *S. flavescens* Marsh, and * *S. hispidula* Fabricius; Europe. (See Clover.)

LEPIDOPTERA.

Lycænidæ.*Zizera labradus* Godt.; Australia; attacks pods. (See Beans.)

DIPTERA.

Agromyzidæ.*Phytomyza affinis* Fallen. (See Tobacco.)

PEACH; ALMOND.(*Amygdalus* spp. Family Rosaceæ.)

Delicious fruit-bearing trees of temperate and warm climates. The almond pit is much sold as a nut.

A. BETTER KNOWN PEACH INSECTS LIKELY TO BE IMPORTED.***Uracanthus acutus* Blackburn.**

(Cerambycidæ; Coleoptera.)

Hosts: Peach, apricot, plum.

Description and biology: *Adult*, length about 14 mm.; color obscure ferruginous; covered with short pubescence.

Distribution: Australia.

BLACKBURN, T. Proc. Linn. Soc. New South Wales, ser. 2, 1889, vol. 4, p. 451.

***Conogethes punctiferalis* Guérin.**

(Northern Peach Moth. Pyralidæ; Lepidoptera.)

Host: Peach.*Injury:* Infests the fruit.

Description: *Adult*, wing expanse 21–25 mm., bright yellow, thickly mottled with black spots. *Pupa* dark reddish brown. Pupates on side of peach stone. *Larva*, length 20 mm., cylindrical, with a few erect hairs; color dirty white, almost hidden by pinkish markings. Attacks ripening fruit, eating and webbing surface. *Eggs* deposited on half-grown peaches.

Distribution: Australia.

FROGGATT, W. W. Australian Insects, 1907, p. 273.

TRYON, HENRY. Ann. Rept. Dept. Agri. for years 1889–90, p. 75. Brisbane, Queensland, 1890.

B. OTHER IMPORTANT PEACH INSECTS.

HEMIPTERA.

Coccidæ.

Armored—

Aspidiotus (Pseudaonidia) clavigera Cockerell; Hawaii.* *Aspidiotus (Diaspidiotus) ostreæformis* Curtis; British Isles.*Diaspis leperii* Signoret; Europe.*Diaspis squamosus* Newstead and Theobald; Egypt.* *Epidiaspis piricola* Del Guercio; Europe.*Parlatoria affinis* Newstead; Algeria.*Parlatoria calianthina* Berlese and Leonardi; Algeria, Italy.* *Pseudoparlatoria parlatorioides* (Comstock); Brazil, Mexico.

Unarmored—

Lecanium kunoensis Kuwana; China.* *Lecanium persicæ* (Fabricius); Europe.*Lecanium rugosum* Signoret; France, Germany.*Lecanium vini* Bouché; Europe.**Lygæidæ.***Nysius vinitor* Bergroth; Australia. (See Fruit.)

COLEOPTERA.

Elateridæ.*Agriotes lineatus* Linnæus. (See Tobacco.)**Bostrychidæ.***Apate monachus* Fabricius; Africa, West Indies, attacks almond. (See Citrus.)**Chrysomelidæ.***Aulacophora olivieri* Guérin, leaf beetle; Australia. (See Cucurbits.)

Brachyrhinidae.

Brachyrhinus ligustici Linnæus; Europe. (See Grape.)

Brachyrhinus corruptor Host; Italy; attacks almond. (See Grape.)

Scolytidae.

Scolytus amygdali Guérin; Mediterranean region; bark beetle in almond and apricot trees, very injurious.

LEPIDOPTERA.

Xyloryctidae.

Cryptophaga unipunctata Donovan; Australia. (See Plum, Cherry.)

Pyralidae.

Dichocrocis punctiferalis Guénée; Queensland. (See Corn.)

DIPTERA.

Trypetidae.

Ceratitis capitata Wiedemann, attacks peach and almond. (See Fruit.)

Anastrepha ludens Loew; Mexico. (See Fruit.)

Dacus diversus Coquillett; India. (See Fruit.)

Dacus persicæ Rig.; India. (See Fruit.)

Bactrocera tryoni Froggatt; Orient. (See Fruit.)

PEAR.

(*Pyrus communis*, etc. Family Rosaceæ.)

Fruit trees native of south-central Europe and Asia and much cultivated in this country for their delicious fruits.

A. BETTER KNOWN PEAR INSECTS LIKELY TO BE IMPORTED.***Psylla pyrisuga* Förster.**

(The Large Pear Psylla. Psyllidæ; Hemiptera.)

Host: Pear.

Injury: Quite injurious in middle Europe and Japan.

Description and biology: *Adult* marked with black and red, wings yellow. Female about 3.5 mm. and male 2.5 mm. in length. Winters in adult condition under bark scales of the trees. *Eggs* are laid singly or in small groups in hairs of leaf and flower stems or on leaves. *Nymph* is dark yellow in color, with waxy secretion. The foliage is distorted and leaves rolled up; also the young branches are killed and young fruit destroyed.

Distribution: Europe, Japan.

HENCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 490.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 647.

***Stephanitis pyri* Fabricius.**

(The Pear Tingis. Tingitidæ; Hemiptera.)

Hosts: Pear, apple.

Injury: Serious pest to pear and apple in Europe.

Description and biology: *Adult*, about 3 mm. long; body flat and covered with relatively large wings of a beautiful lace network; lobes of same pattern extend from each side of prothorax; general color brownish, with dark bands across wings. *Nymph* oval in outline, pale greenish in color and abdominal segments each with a spine on each side; two transverse dusky bands on bodies of older individuals. *Eggs* ovate, oblong, greenish white in color, 0.6 mm. long. Adults winter around base of host plants, reproducing in spring on under surface of leaves, where all stages may

be found at same time during summer. Badly infested leaves become yellow, then brown, and die. (See text fig. 79.)

Distribution: Europe.

COSTA, ACHILLE. *Insetti nocivi all' Agricoltura*, 1879, p. 166.

SILVESTRI, F. *Dispense di Entomologie Agraria*, 1911, p. 82.

***Nephopteryx rubrizonella* Ragonot.**

(Pear Fruit Borer. *Pyralidæ*; *Lepidoptera*.)

Host: Pear.

Injury: Destroys yearly 30 to 40 per cent of fruit.

Description and biology: *Adult*, wing expanse 25 mm. Forewing grayish brown to grayish black, crossed by two equidistant irregularly pinnated grayish-bordered black lines; outer margin and basal half much deeper in color; hindwing dark gray; thorax colored like forewing, abdomen paler. Two brooded; first occurs in July, second in September and October. *Pupa*, deep reddish brown. Pupates in core of



FIG. 79.—The pear tings (*Stephanitis pyri*): *a*, Injured leaf; *b*, *d*, nymphal stages; *e*, much enlarged hair; *f*, adult. (Costa.)

fruit. *Larva*, length 20 mm.; spindle-shaped, color pinkish brown; attacks core of fruit. Stage lasts three weeks or more. *Eggs*, deposited on lower surface of twigs, about 20 in a mass, covered by a white silk web.

Distribution: Japan.

MATSUMURA, M. U. S. Dept. Agric., Div. Ent., Bul. 10, 1898, p. 38.

***Dasyneura pyri* Bouché.**

(Pear Leaf-Curling Midge. *Itonididæ* [*Cecidomyiidæ*]; *Diptera*.)

Host: Pear.

Injury: Rolls edges of leaves.

Description and biology: *Adult*, length 2 mm. Brown, with limpid wings and tawny palpi. Occurs in spring. *Pupates* in the soil. Whitish maggots.

Distribution: Europe.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 350.

Janus compressus Fabricius.

(The Bud-stinger. Tenthredinidæ; Hymenoptera.)

Host: Pear.*Injury*: Hollows out medullary canal in twigs.

Description and biology: *Adult* male, length 7 mm.; color black, with a transverse yellow band on thorax; abdomen entirely yellow; female 8 mm.; blackish, with three yellow spots on thorax and circle of red on abdomen. Occurs in May. One generation. *Pupates* in spring in gallery in shoot. *Larva*, length 6 mm.; white; makes gallery in twig. Winters in this stage in lower part of gallery. *Eggs* placed in buds.

Distribution: Europe.

GENAUX, G. Entomologie et Parasitologie Agricoles, 1904, p. 304.

MUTILLOT, L. Les Insectes Nuisibles, 1891, p. 189.

Pamphilius flaviventris Retz.

(Social Pear Sawfly. Tenthredinidæ; Hymenoptera.)

Hosts: Pear, plum, cherry, white thorn, and other rosaceous plants.*Injury*: Considerable damage. Strips foliage from trees.

Description and biology: *Adult*, female, black; antennæ and legs yellowish; abdomen tawny at apex, with yellow triangular mark on sides of segments; ventrally bands of yellow; male, abdomen reddish yellow from second segment to apex; lower part of head yellow; wing expanse 8–12 mm. *Pupates* in cocoon in soil. *Larva*, length 25 mm.; orange yellow; head black; two black spots on second segment; has no prolegs; spins tent over leaves on which it feeds; winters in cocoon; may suspend development and remain in soil over a second winter. *Eggs* are deposited on under surface of leaves in groups of 30 to 60. Incubation requires 6 or 7 days.

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 338.

IMPORTANT PEAR INSECTS.**HEMIPTERA.****Coccidæ.**

Armored—

Aspidiotus (Diaspidiotus) africanus Marlatt; Africa.**Aspidiotus (Aonidia) lauri* Bouché; Germany.**Aspidiotus (Diaspidiotus) ostreæformis* Curtis; Europe, Canada.*Aspidiotus pectinatus* Lindinger; South Africa.*Aspidiotus (Diaspidiotus) pyri* Lichtenstein; France, Switzerland.**Diaspis pentagona* Targioni-Tozzetti; South Africa, Australia, Italy.*Diaspis pyri* Colvée; Spain, Germany.*Diaspis santali* Maskell; New Zealand.*Diaspis squamosus* Newstead and Theobald; Great Britain.**Epidiaspis piricola* Del Guercio; Germany, Italy, France, Russia.*Parlatoria calianthina* Berlese and Leonardi; Spain, Victoria, New South Wales.*Parlatoria pyri* Marlatt; China.

Unarmored—

Ceroplastes rubens Maskell; Australia, Hawaii, Japan.**Lecanium bituberculatum* Targioni-Tozzetti; England, France, Sweden, Italy, Germany.*Lecanium capreæ* Linnæus; Europe, Nova Scotia.*Lecanium coryli* Linnæus; Europe, Algeria.*Lecanium glandi* Kuwana; Japan.*Lecanium kunoensis* Kuwana; China.*Lecanium rugosum* Signoret; France, Germany.*Lecanium tilix* Linnæus; Europe.*Lecanium vini* Bouché; Europe.**COLEOPTERA.****Buprestidæ.****Agrilus sinuatus* Olivier; Europe; introduced into United States; borer.**Cerambycidæ.***Cerambyx scopolii* Fuessly; Europe; borer.*Liopus nebulosus* Linnæus; Europe; borer.

Curculionidæ.

Magdalis cerasi Linnæus; Europe; bores in branches.

Anthonomus pomorum Linnæus; Europe; bud weevil. (See Apple.)

Anthonomus pedicularius Linnæus, *A. pyri* Boheman, and *A. spinotus* Redtenbacher; Europe; weevils.

Leptops hopei Schonherr; Victoria. (See Apple.)

Scolytidæ.

Scolytus pruni Ratzeburg; Europe. (See Plum.)

Taphrorychus bicolor Herbst; Europe; galleries in trees.

LEPIDOPTERA.

Lasiocampidæ.

Gastropacha quercifolia Linnæus. (See Fruit.)

Geometridæ.

Anisopteryx æscularia Schiffermiller. (See Forests.)

Cossidæ.

Cossus tristis Dru.; Africa. (See Apple.)

Tortricidæ.

Capua angustiorana Haworth; Europe, Asia, Africa. (See Apricot.)

HYMENOPTERA.

Tenthredinidæ.

Priophorus padi Linnæus; Europe. (See Plum.)

DIPTERA.

Trypetidæ.

Anastrepha fraterculus Wiedemann. (See Fruit.)

Ceratitis capitata Wiedemann. (See Fruit.)

Itonididæ.

* *Contarinia pyrivora* Riley; Europe, North America; gall midge.

PERSIMMON.

(*Diospyros* spp. Family Ebenaceæ.)

Fruit trees of the tropics, of which several species are cultivated in this country.

IMPORTANT PERSIMMON INSECTS.

HEMIPTERA.

Coccidæ.

Armored—

Aspidiotus (Aonidia) ebeni Leonardi; Ceylon.

Unarmored—

Ceroplastes rubens Maskell; Japan; *Diospyros kaki*.

Coccus bicruciatatus Green; Ceylon; *Diospyros ebenum*.

Phenacoccus pergandei Cockerell; Japan; *Diospyros kaki*.

DIPTERA.

Trypetidæ.

Anastrepha fraterculus Wiedemann, attacks *Diospyros kaki*, the Japanese persimmon. (See Fruit.)

Ceratitis capitata Wiedemann, attacks *Diospyros kaki*. (See Fruit.)

LEPIDOPTERA.

Cosmopterygidæ.

Kakivoria flavofusciata Nagano; Japan; injures fruit.

PINE.

(*Pinus* spp. Family Pinaceæ.)

Evergreen resiniferous trees distributed throughout the northern hemisphere; in the tropical and subtropical regions they are confined to the mountains. They are very valuable timber trees and many of them yield turpentine, tar, pitch from the trunk, and medicinal oils from the leaves and young shoots. Edible seeds are produced by some. For convenience the insect pests are arranged under Conifers.

PINEAPPLE.(*Ananas sativus*. Family Bromeliaceæ.)

A plant indigenous to America but now cultivated in Hawaii and other parts of the world.

IMPORTANT PINEAPPLE INSECTS.**HEMIPTERA.****Coccidæ.**

Armored—

Aspidiotus (Targionia) bromeliæ Leonardi; England, Seychelles.

Unarmored—

Pseudococcus ananassæ Kuwana; Japan.*Pseudococcus brevipes* Cockerell; Jamaica, Antigua, Dominica.*Pseudococcus bromeliæ* Bouché; Hawaii.**LEPIDOPTERA.****Tineidæ.***Ereunetis flavistriata* Walsingham; Hawaii. (See Sugar cane.)**DIPTERA.****Trypetidæ.***Ceratitis capitata* Wiedemann. (See Fruit.)*Dacus xanthodes* Broun. (See Fruit.)**COLEOPTERA.****Calandridæ.***Metamasius ritchiei* Marshall; Jamaica. (Bull. Ent. Res., vol. 7, p. 197.)**PISTACHIO.**(*Pistacia vera*, etc. Family Anacardiaceæ.)

A nut-bearing tree of Asia and Europe, cultivated in California.

IMPORTANT PISTACHIO INSECTS.**HEMIPTERA.****Coccidæ.**

Armored—

Diaspis gennadii Leonardi; Greece, Italy.*Leucaspis pistaciæ* Lindinger; Cyprus; *Pistacia lentiscus*.

Unarmored—

Ceroplastes rusci Linnæus; *Pistacia lentiscus*, *P. terebinthus*.**PLANE TREE; BUTTONWOOD; SYCAMORE.**(*Platanus* spp. Family Platanaceæ.)

Ornamental deciduous trees of America, Europe, and Asia, valued for their dense shade.

IMPORTANT SYCAMORE INSECTS.**COLEOPTERA.****Anobiidæ.***Xestobium rufovillosum* DeGeer; England; bores in wood of old-standing trees.**Scarabæidæ.***Melolontha hippocastani* Fabricius and *M. melolontha* Linnæus, Europe; larvæ injure roots of seedlings.**Cerambycidæ.***Æolesthes sarta* Solsky; India; bores in trunks of *Platanus orientalis*.**Ipidæ.***Anisandrus dispar* Fabricius; Germany; ambrosia beetle.**LITERATURE.**

LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

HESS, R. Der Forstschutz, 1900, vol. 2.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

PLANTAIN.

(See Banana.)

PLUM; CHERRY; PRUNE.*(Prunus* spp. Family Rosaceæ.)

Deciduous trees of the northern hemisphere, with showy flowers and delicious fruits, of which many horticultural varieties are cultivated in this country.

A. BETTER KNOWN PLUM INSECTS LIKELY TO BE IMPORTED.* *Eriophyes* spp.

(Plum Blister Mites. Eriophyidæ; Acarina.)

Species: **E. phloeocoptes* Nalepa; Europe, North America; *Prunus domestica*, *P. insititia*, *P. spinosa*. *E. similis* Nalepa; Europe; *Prunus armeniaca*, *P. chamæcerasus*, *P. domestica*, *P. insititia*, *P. spinosa*. **E. padi* Nalepa; Europe, North America; *Prunus padus*, *P. domestica*, *P. spinosa*.

Injury: Form different kinds of blister galls on plum trees and are quite injurious. These four-legged blister mites are so small that they are easily transported on nursery stock, hence the wide distribution.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 125-127.

Psylla pruni Scopoli.

(The Plum Psylla. Psyllidæ; Hemiptera.)

Hosts: Plum, *Prunus spinosa*; *P. insititia*.

Injury: Not at present an important pest.

Description and biology: *Adult*, thorax marked with red and brown; abdomen with broad brown bands on sides and back; wings dark brown. Development and generations similar to *P. pyrisuga*. (See Pear.)

Distribution: Europe, Siberia.

HENCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 490.

Peltophora pedicellata Kirby.

(The Cherry Bug. Pentatomidæ; Hemiptera.)

Hosts: Cherry; strong-scented flowering shrubs; wild fig.

Injury: Probably not at present important.

Description and biology: *Adult*, about 12 mm. long; bright metallic green in color with black spots on dorsum. The greater part of ventral surface, edges of thorax, and two blotches at base of scutellum bright coral red.

Distribution: Australia (New South Wales to North Queensland).

FROGGATT, W. W. Australian Insects, 1907, p. 327.

Diphucephala colaspidoides Gyllenhal.

(The Cherry Green Beetle. Scarabæidæ; Coleoptera.)

Hosts: Cherry and other fruit trees; shrubs.

Injury: Very serious at times. Defoliation by adults.

Description and biology: *Adult*, length 8 mm.; metallic green; smooth; elytra deeply marked with punctured striæ. Damage done in this stage. *Larva* feeds on roots of various plants. Not of economic importance. (See plate xxxiii.)

Distribution: Southern Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1893, pt. 2, p. 27.

Rhynchites coeruleus De Geer.

(Twig Cutter. Rhynchitidæ; Coleoptera.)

Host: Apple.*Injury:* Cuts off apple shoots. Only nursery stock and bush trees attacked.

Description and biology: *Adult*, length 3–4 mm.; deep blue, shiny, clothed with long, upright fuscous pubescence; antennæ, legs, and rostrum black; elytra, with deep punctured striæ. Appear in spring and feed on leaves. *Pupate* in soil. *Larvæ* white, feed about a month, then enter soil. *Eggs* placed singly in soft shoots 2 to 4 inches from tips. Shoots cut off below place of oviposition. (See text fig. 80.)

Distribution: Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 117.

Rhynchites cupreus Linnæus.

(Plum Borer. Rhynchitidæ; Coleoptera.)

Hosts: Plum, prune, cherry.*Injury:* Attacks young fruit.

Description and biology: *Adult*, length 3–4 mm., color bronze-copper. Occurs in autumn, hibernates in this stage and reappears in early spring. *Pupates* in ground. *Larva* develops in fruit, causing it to fall. *Eggs* are placed singly in young fruit at base of peduncle. (See text fig. 81.)

Distribution: Europe.

HENSCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 81.

Brachyrhinus lævigatus Fabricius (*Otiorhynchus*).

(Brachyrhinidæ; Coleoptera.)

Host: Plum.*Injury:* To buds and young twigs.

Description and biology: *Adult*, length 6–6.5 mm.; black, shining, without hairs; neck-shield rather flat, disk punctured; wing covers finely furrowed.

Distribution: Middle Europe.

HENSCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 109.

Magdalis armigera Geoffroy.

(Plum Stem Piercer. Curculionidæ; Coleoptera.)

Host: Plum.*Injury:* To twigs and foliage.

Description and biology: *Adult*, length 3.5–4.5 mm.; color, dull black; neck shield with thorn-like projections near fore margin, 4-cornered, hardly as wide as long, finely punctate; elytra strigose punctate, space between punctations flat; beak shorter than neck shield. Adult attacks leaves. *Larva* develops in twig. *Pupates* in burrow.

Distribution: Europe.

HENSCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 94.



FIG. 80.—Plum twig-cutter (*Rhynchites cœrucus*): Adult and injury. (Theobald.)

Curculio cerasorum Herbst (**Balaninus**).

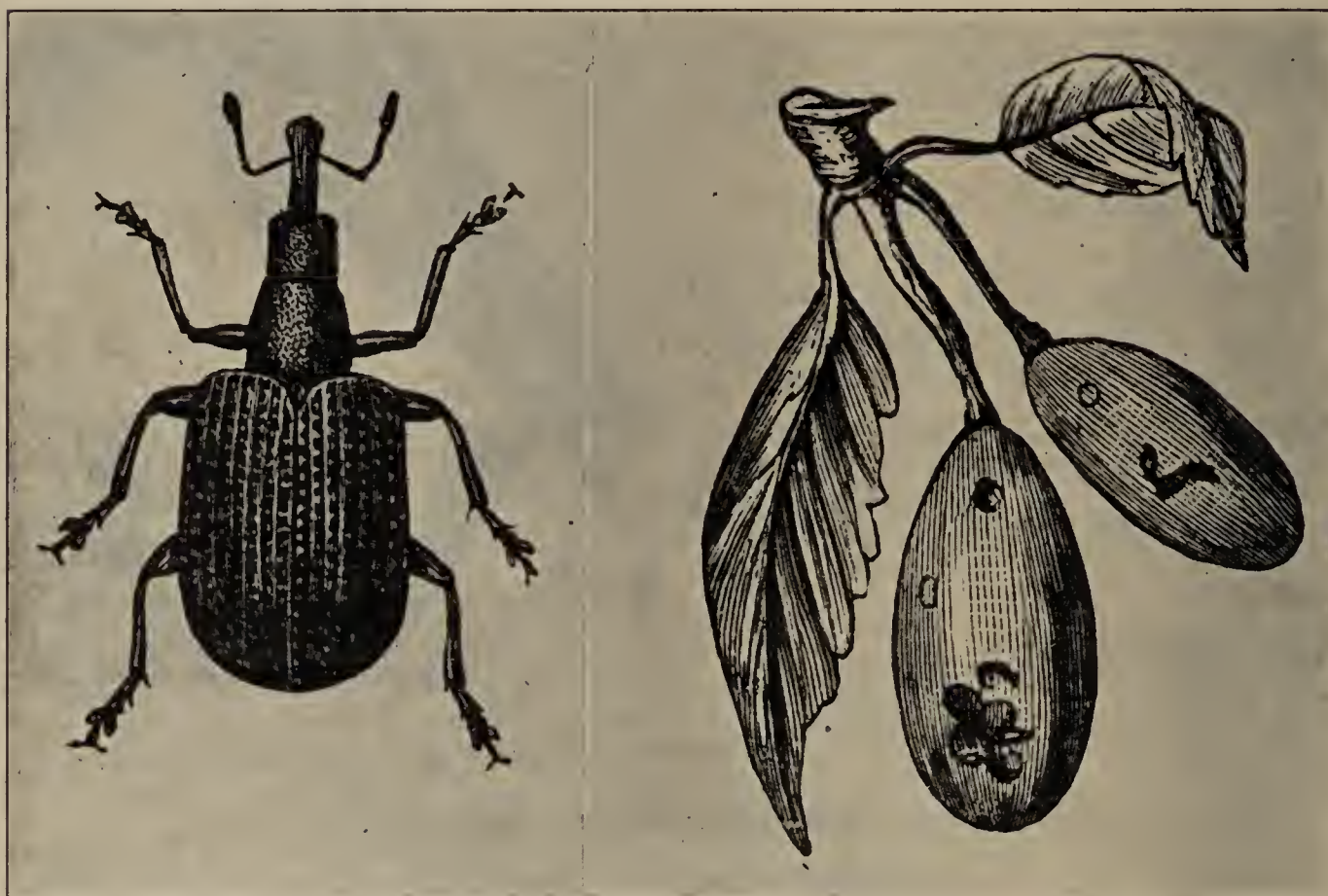
(Cherry Weevil. Curculionidæ; Coleoptera.)

Host: Cherry.*Injury:* To fruit.*Description and biology:* Adult, length 3–3.5 mm.; color clear brownish red; eyes black; prothorax and ventral surface covered with golden hairlike scales. Larva eats out cherry pit. Pupation takes place in pit.*Distribution:* Germany.

HENSCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 91.

Anthonomus rectirostris Linnæus.

(Curculionidæ; Coleoptera.)

Hosts: Cherry and other fruits.*Injury:* Attacks the fruit.FIG. 81.—Plum borer (*Rhynchites cupreus*): Adult and injury. (Henschel.)*Description and biology:* Larva feeds on seeds, preventing fruit from ripening. Eggs are deposited in young fruit.*Distribution:* Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d. ed., 1913, vol. 3, p. 556.

Scolytus assimilis Boheman.

(Scolytidæ; Coleoptera.)

Host: Plum.*Injury:* Attacks bark and sapwood. Very destructive.*Description:* Habits similar to *S. rugulosus*.*Distribution:* Argentina.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 572.

Scolytus pruni Ratzeburg.

(Scolytidæ; Coleoptera.)

Hosts: Plum, pear, apple.*Injury:* Destroys many trees, makes galleries under bark.

Description and biology: *Adult*, length 4 mm.; head and thorax black, elytra chestnut. Appears in June (France). *Pupates* in spring. *Larval* galleries perpendicular to maternal gallery. *Eggs* deposited in gallery under bark of weakened trees.

Distribution: Europe.

MONTILLOT, L. *Les Insectes Nuisibles*, 1891, p. 168.

GUENAU, G. *Entomologie et Parasitologie Agricoles*, 1904, p. 340.

***Coleophora anatipennella* Hübner.**

(Cherry Tree Case-Bearer. Elachistidæ; Lepidoptera.)

Hosts: Cherry, apple, sloe.

Injury: Serious attacks at intervals of a few years; feeds on buds and early foliage.

Description and biology: *Adult*, wing expanse 12 mm.; forewings creamy white with

scattered fuscous scales noticeable toward tips, fringe white; hind wings dusky, with long gray fringes. Occurs July to August. *Pupa* pale brown in color; pupation takes place in its case; period 3 or 4 weeks. *Larva*, length 12 mm.; reddish brown to orange with dark-brown shiny head. Larval case pistol-shaped, dark brown to black, with white border around mouth. Larvæ may be found

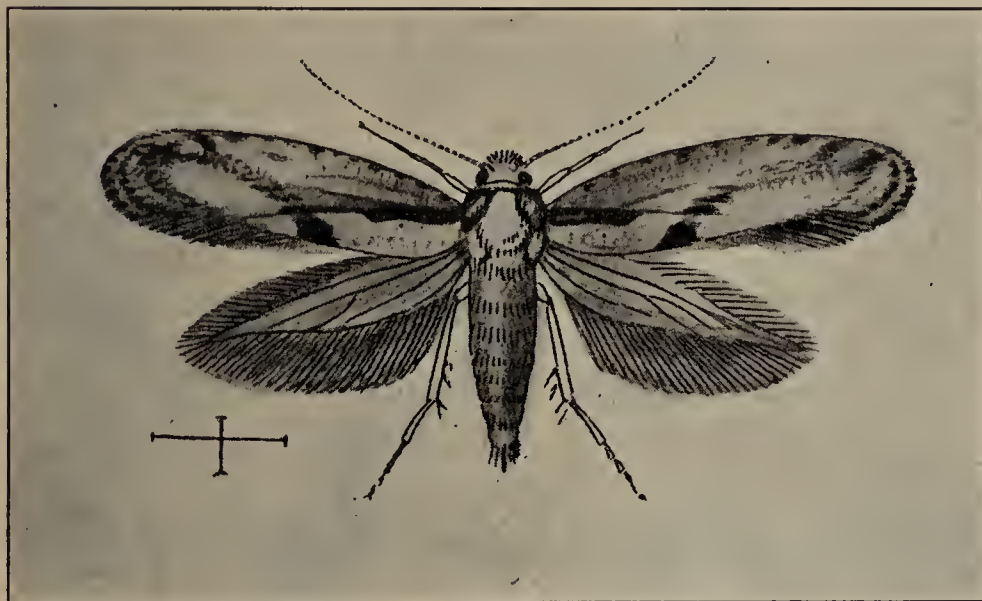


FIG. 82.—Cherry fruit moth (*Argyresthia nitidella*): Adult moth. (Theobald.)

from August through the winter until June. *Eggs* are deposited on under side of leaf, hatching in 2 or 3 weeks.

Distribution: Europe.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 195.

***Argyresthia ephippella* Fabricius.**

(Hyponomeutidæ; Lepidoptera.)

Hosts: Cherry, plum, hazel.

Injury: Not seriously destructive.

Description and biology: *Adult*, wing expanse 12 mm.; forewings ochereous brown, inner margin white, interrupted beyond middle by dark-brown spot, which can be traced across the wings as an oblique fascia terminating in the costa. *Larva* feeds on shoots, leaf, and blossom buds.

Distribution: Europe.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 193.

***Argyresthia nitidella* Fabricius.**

(Cherry Fruit Moth. Hyponomeutidæ; Lepidoptera.)

Hosts: Cherry, hawthorn.

Injury: Seldom serious. Attack fruit just after it has set.

Description and biology: *Adult*, wing expanse 11 mm.; forewings light brown, with white or cream colored inner margins; in middle there is a fascia of deeper brown color which terminates in tip of wings. Occurs in May (Stainton). *Cocoon* dense and white; pupal period about 15 days. *Larva* light green; head, first thoracic segment and legs brown. *Eggs* placed on shoots near flower bud. Overwinters in egg stage. (See text fig. 82.)

Distribution: England.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 192.

Xylina ornithopus Rott.

(Gray Plum Owlet Moth. Noctuidæ; Lepidoptera.)

Host: Plum.*Injury:* Defoliation.

Description and biology: *Adult*, forewing 15–17 mm. long; grayish white mixed with weak brownish. Occurs August and September (Germany). *Pupates* in July in earth. *Larva* 33 mm. long; blue-green in color, marked with white spots; three white dorsal lines; head whitish green. Overwinters as *egg*.

Distribution: Europe.

HENSCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 361.

Xylina socia Rott.

(Brown Plum Owlet Moth. Noctuidæ; Lepidoptera.)

Hosts: Plum, elm, linden.*Injury:* Defoliation.

Description and biology: *Adult*, forewing 17–20 mm. long; brown with a mixture of gray or rose color. Occurs August and September (Germany). *Pupates* in earth. *Larva* length 33 mm.; color apple-green; marked with white spots and a broad white dorsal stripe; head shining green. Overwinters as *egg*.

Distribution: Europe.

HENSCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 361.

Laspeyresia funebrana Treitschke.

(Red Plum Maggot. Tortricidæ; Lepidoptera.)

Host: Plum.

Injury: Attacks fruit; damage not easy to detect. "Caterpillar plentiful in plum pies." (Stainton.)

Description and biology: *Adult*, wing expanse about 12 mm.; forewings purplish gray, clouded with smoky gray; at anal angle is an indistinct, ocellated patch, edged with pale gray and inclosing four black dots. *Pupates* in whitish cocoon under rough bark or débris in spring. *Pupa* amber color. *Larva*, length 15 mm., chestnut red in color, with sides yellowish or entirely deep red. *Eggs*, placed at base of fruit stalk, hatching in 10 days. (See text fig. 83.)

Distribution: Europe, Asia Minor.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 363.

Laspeyresia woerberiana Schiffermiller.

(Bark Tortrix. Tortricidæ; Lepidoptera.)

Host: *Prunus* sp. and other fruits.*Injury:* Injury to bark.

Description and biology: *Adult*, wing expanse 16 mm., forewing dark brown, with rusty-yellow and lead-gray oblique lines; five white notches on fore margin, and a twisted lead line from the notches to the eye spot; speculum on a rusty-yellow ground, marked with black. Two broods, first May and June; second August and September (Germany). *Pupa* chestnut brown, pupates in larval gallery. *Larva* length 9 mm.; dirty green, red-headed, sparsely hairy. Feeds in galleries in bark; betrayed by masses of frass hanging out of air holes. *Eggs* placed in crevices in bark.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 283.



FIG. 83.—Red plum maggot (*Laspeyresia funebrana*): Moth and larva in fruit. (Henschel.)



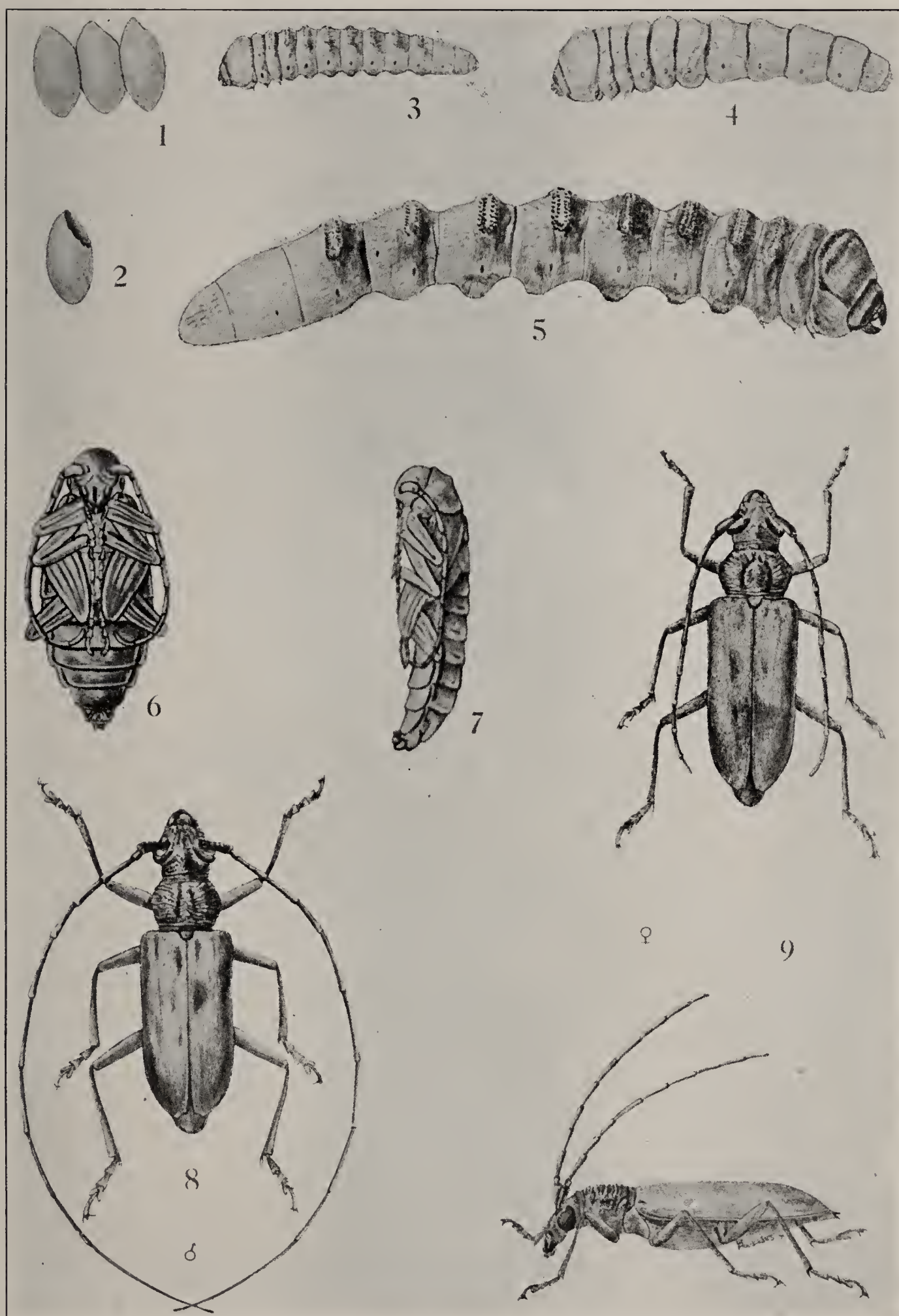
A DESTRUCTIVE CHERRY INSECT.

The cherry green beetle (*Diphucephala colaspoides*): Adult, larva and injury (French.)



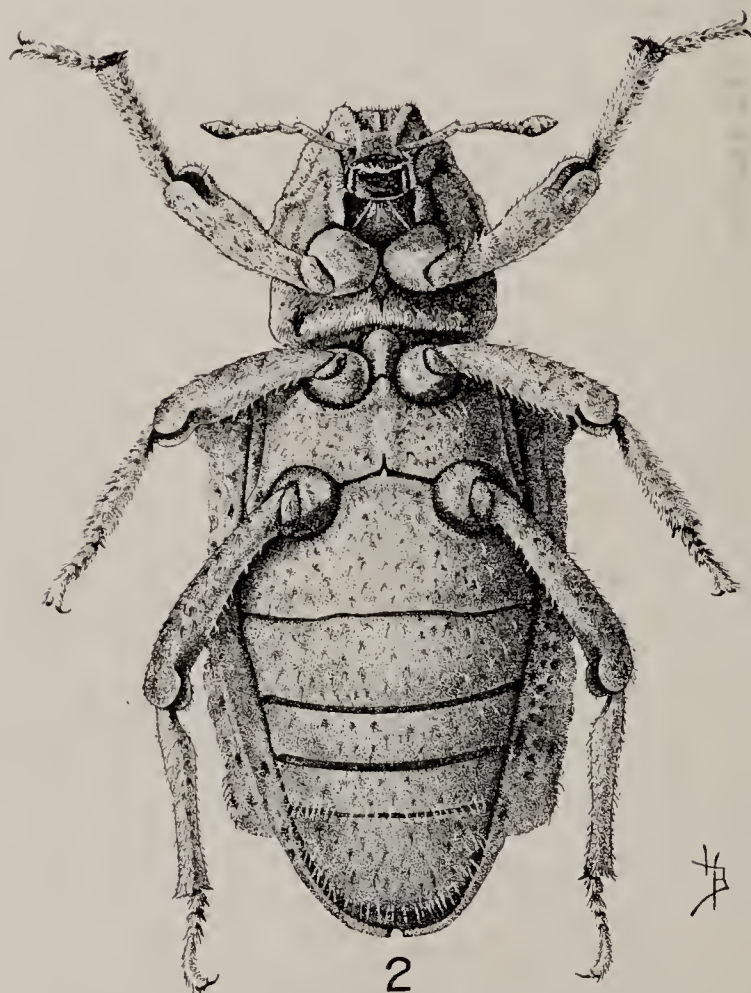
THE CHERRY BORER.

The cherry borer (*Cryptophaga unipuncta*): Moth, larva, pupa, and injury. (French.



A. POPLAR BORER.

Poplar borer (*Aeolesthes sarta*): FIG. 1.—Eggs. FIG. 2.—Empty egg. FIGS. 3, 4, 5.—Larval stages. FIGS. 6, 7.—Pupa. FIG. 8.—Male. FIG. 9.—Females. (Stebbing.)



POTATO WEEVIL. RHIGOPSIDIUS TUCUMANUS HELLER. (PIERCE.)

Cryptophaga unipunctata Donovan.

(The Cherry Borer. Xyloryctidæ; Lepidoptera.)

Hosts: Cherry, peach, honeysuckle.*Injury*: Very serious. Makes shallow tunnels in branches of trees.*Description and biology*: *Adult*, wing expanse 37 mm.; a white satiny moth; front of head, antennæ, and a dot on forewings, black. *Larva*, length, 50 mm.; pinkish white, hairy; covers entrance to burrow with silken web in which collects the sawdust-like excrement. (See plate xxxiv.)*Distribution*: Australia.

FRENCH, C. Handbook of Destructive Insects of Victoria, 1891, pt. 1, p. 113.

FROGGATT, W. W. Australian Insects, 1907, p. 277.

Olethreutes pruniana Hübner.

(Plum Bud-moth. Tortricidæ; Lepidoptera.)

Host: *Prunus* sp.*Injury*: To buds and shoots.*Description and biology*: *Adult*, forewing 7-8 mm.; from middle of fore margin to inner angle, bluish black, mixed with brownish black; border third golden white clouded with brownish gray; apical point deep black; palpi grayish black; occurs June and July (Germany). *Pupates* in grass, or between leaves sewed together, during latter part of May. *Larva*, length 20 mm.; greenish yellow, head white, divided thoracic shield and anal lobes shining black; feeds in shoots and developing leaves drawn together; occurs in spring until middle of May. *Eggs* placed singly on buds. Overwinters in egg stage.*Distribution*: Europe.

HENSCHEL, G. A. O. Die Schädlichen Forst- und Obstbaum-Insekten, 1895, p. 418.

MONTILLOT, L. Les Insectes Nuisibles, 1891, p. 176.

Hoplocampa fulvicornis Panzer.

(Plum Fruit Sawfly. Tenthredinidæ; Hymenoptera.)

Host: Plum.*Injury*: Frequently causes considerable damage. Attacks fruit and eats out interior. Causes fruit to fall.*Description and biology*: *Adult*, wing expanse less than 8 mm.; color black, with yellow, yellowish-red or reddish-brown legs. *Pupates* in soil in brownish cocoon. *Larva*, length 12 mm.; creamy-white, sometimes slightly pinkish; head brown; caudal end somewhat attenuated and slightly curved. *Eggs* minute, greenish white and transparent; placed in unopened blossom; hatch in a few days. (See text, fig. 84.)*Distribution*: England, Europe.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 376.

Prophorus padi Linnæus.

(Plum Leaf Sawfly. Tenthredinidæ; Hymenoptera.)

Hosts: Plum, pear, hawthorn, bramble, mountain ash, birch.*Injury*: Important. Defoliation.*Description and biology*: *Adult*, female, color mainly black; thorax shiny, covered with grayish brown and two dull white spots; abdomen with scattered, pale, very fine hairs; legs white, except middle of femora, apex of tibia and posterior tarsus,

which are black. Two broods, frequently three. First brood occurs in May, second about middle of June. (England.) Active during warmest part of day. *Pupa* pale gray. Pupates in ground; period 9 to 12 days. *Larva*, green or grayish green, with almost white sides; head usually pale dull orange brown. Larval stage of first brood lasts 3 weeks; second brood overwinters in soil. *Eggs* are placed on under surface of leaves. Incubation requires 8 days. (See text fig. 85.)

Distribution: England, Europe.

THEOBALD, F. V. *Insect Pests of Fruit*, 1909, p. 372.



FIG. 84.—The plum fruit sawfly (*Hoplocampa fulvicornis*): Adult, larva, and injury. (Ent. Tidsk.)

B. OTHER IMPORTANT PLUM AND CHERRY INSECTS.

HEMIPTERA.

Coccidæ.

Armored—

Aspidiotus (Diaspidiotus) patavinus Berlese; Italy; *Prunus cerasus*.

**Diaspis pentagona* Targioni-Tozzetti; Italy, Japan, Cape Colony; *Prunus cerasus*, *P. pseudocerasus*, *P. armeniaca*, *P. laurocerasus*.

Unarmored—

Kuwania parva Maskell; Japan; *Prunus cerasus*.

Lecanium cerasi Goethe; Germany, England; *Prunus cerasus*.

Lecanium cerasorum Cockerell; Japan; *Prunus cerasus*.

Lecanium coryli Linnaeus; Europe; *Prunus cerasus*, *P. armeniaca*, *P. avium*, *P. domestica*, *P. insititia*, *P. laurocerasus*, *P. padus*, *P. spinosa*.

Coccidæ—Continued.**Unarmored—Continued.**

Lecanium rugosum Signoret; France, Germany; *Prunus cerasus*.

Lecanium prunastri Fonscolombe; plum, peach (see pl. iv, fig. 3).

Pulvinaria betulæ Linnæus; Denmark, England, Switzerland; *Prunus cerasus*, *P. armeniaca*, *P. domestica*.

Lygæidæ.

Nysius vinitor Bergroth; Australia; plum and cherry. (See Fruit.)

COLEOPTERA.**Bostrychidæ.**

Apte monachus Fabricius; Africa, West Indies. (See Citrus.)

Buprestidæ.

Cypnodis tenebrionis Linnæus; Europe; bores in *Prunus spinosa*.

Cerambycidæ.

Saperda scalaris Linnæus;
Europe; borer in cherry
trees.

Liopus nebulosus Linnæus;
Europe; borer in cherry
trees.

Uracanthus acutus Blackburn;
Europe. (See Peach.)

Curculionidæ.

Leptopshopci Schonherr; Vic-
toria. (See Apple.)

Magdalis carbonaria Linnæus;
Europe; plum. (See Birch.)

Magdalis cerasi Linnæus, and
M. pruni Linnæus; Europe;
bore under bark of cherry
and plum.

Curculio herbsti Gemminger
(*Balaninus*); Europe;
breeds in fruit of cherry
and plum.

Curculio rubidus Gyllenhal
(*Balaninus*); Europe; breeds
in fruit of plum.

Anthonomus druparum Lin-
næus; Europe; breeds in
buds of plum and cherry.

Scolytidæ.

Scolytus mali Bechst; Europe;
bores in trunk and branches
of plum.

LEPIDOPTERA.**Noctuidæ.**

Diloba cæruleocephala Lin-
næus; Europe; plum,
cherry. (See Apple.)

Xyloryctidæ.

Cryptophaga unipunctata
Donovan; Australia; bores
in cherry trees.

Tortricidæ.

Laspeyresia prunivorana Ragonot; Europe; breeds in fruit.

Olethreutes variegana Hübner, Europe; feeds on buds and shoots.

Geometridæ.

Hibernia rupicaprararia Hübner; Europe. (See Fruit.)

Anisopteryx æscularia Schiffermiller; Europe. (See Forests.)

Biston hirtarius Cl.; Europe; defoliator.

Cheimatobia boreata Hübner, and *C. brumata* Linnæus; Europe; defoliators

Lasiocampidæ.

Gastropacha quercifolia Linnæus; Europe. (See Fruit.)

Lymantriidæ.

Teia anartoides Walker; Australia; cherry. (See Fruit.)



FIG. 85.—Plum leaf sawfly (*Priophorus padi*): Adult and injured leaf. (Theobald.)

Hyponomeutidæ.

* *Hyponomeuta malinellus* Zeller and * *H. padellus* Linnæus; Europe; introduced in United States; cherry. (See Apple.)

* *Argyresthia conjugella* Zeller; Europe, British Columbia, Japan; attacks fruit of cherry and plum. (See Apple.)

HYMENOPTERA.

Tenthredinidæ.

Pamphilius flaviventris Retz.; Europe. (See Pear.)

Hoplocampa rutilicornis Panzer, sawfly; mines in fruit; Europe.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann, attacks fruit of *Prunus cerasus*. (See Fruit.)

Anastrepha fraterculus Wiedemann, attacks Japanese plum. (See Fruit.)

Anastrepha ludens Loew.; Mexico. (See Fruit.)

POMEGRANATE.

(*Punica granatum*. Family Lythraceæ.)

A fruit-bearing tree of Asia, extensively cultivated throughout the world. Propagated by cuttings and seed.

IMPORTANT POMEGRANATE INSECTS.

LEPIDOPTERA.

Lycænidæ.

Virachola insocrates Fabricius; India; bores in fruit. (See Fruit.)

Virachola livia Klug, the pomegranate butterfly; Egypt; larvæ attacks fruit (Gough, L. H.: The Agric. Journ. Egypt, vol. 3, 1914, p. 105, pl. 8, figs. 5-7.)

Pyrallidæ.

Cryptoblabes gnidiella Miller; Egypt; breeds in fruit (Gough, l. c., p. 104).

POPLAR; ASPEN; COTTONWOOD.

(*Populus* spp. Family Salicaceæ.)

Soft-wooded trees of the Northern Hemisphere, often used in landscape gardening.

A. BETTER KNOWN POPLAR INSECTS LIKELY TO BE IMPORTED.**Saperda** spp.

(Poplar Borers. Cerambycidæ; Coleoptera.)

Species: *S. carcharias* Linnaeus, poplar borer; Europe; poplar, willow, aspen. *S. populnea* Linnaeus, aspen borer; Europe, Siberia, United States Pacific coast; aspen, poplar, willow. *S. scalaris* Linnaeus; Europe; aspen, walnut, cherry, apple, beech.

Injury: The first two are very injurious species.

Biology: The egg is laid in the bark and the larva first bores in the bark but later goes into the wood. It pupates in the larval tunnel.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 505, 506.

Trochilium spp.

(Hornet Moths. Sesiidæ; Lepidoptera.)

Species: *T. apiformis* Clerck; Europe; poplar (*Populus nigra*, *P. canadensis*); aspen (*Populus tremula* L.); ash. *T. amnatixforme*; India; *Populus euphratica*.

Injury: Bore in wood.

Description and biology: Moths clear winged, wasplike in appearance. Larva bores in wood. Pupates in cell of frass near exterior.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 327.

NÜSSLIN, OTTO. Leitfaden der Forstinsectenkunde, 2d ed., 1913, pp. 317, 318, fig. 269, a.

STEBBING, E. P. Manual Forest Zoology India, 1908, pp. 124, 125, fig. 255.

B. OTHER IMPORTANT POPLAR INSECTS.

HEMIPTERA.

Aphididæ.

Pemphigus bursarius Linnæus; Europe; foliage.

Pemphigus immunis and *P. napæus*; India; attacks the twigs of *Populus euphratica* and *P. tremula*.

Pemphigus filaginis Fonsc. (*marsupialis* Koch); Europe; forms pocket-shaped galls on the midrib of leaves of poplar.

Pemphigus vesicalis Koch; Europe; foliage of *Populus alba*.

Asiphum tremulæ De Geer; Europe; attacks young shoots, leaves and petioles of aspen (*Populus tremula*).

Coccidæ.

Armored—

Chionaspis sativæ Linnæus; Europe; *Populus balsamifera*, *P. monilifera*, *P. nigra*, *P. tremula*.

Crypthemichionaspis africana Newstead; Egypt.

Unarmored—

Ceroplastes rusci Linnæus; Italy.

Pulvinaria betulæ Linnæus; Europe; *Populus alba*, *P. nigra*, *P. tremula*.

Lecanium coryli Linnæus; Europe; *Populus alba*, *P. tremula*, *P. virginiana*.

Lecanium ciliatum Douglas; Europe; *Populus alba*, *P. tremula*.

COLEOPTERA.

Anobiidæ.

Ptilinus fuscus Geoffroy; Europe; bores in dead wood of standing living trees.

Buprestidæ.

**Agilus viridis* Linnæus (see Oak) and *A. sexguttatus* Brahm.; Europe, bore in bark and branches of poplars and aspens.

Capnodis miliaris Klug; India; bores in *Populus euphratica*.

Pæcilonota variolosa Paykull; Europe; bores in bark of poplar and aspen.

Melanophila picta Pallas; South Europe, Algeria; bores in wood of young poplars.

Scarabæidæ.

Amphimallon solstitialis Linnæus; Europe; larvæ attack roots of small plants.

Melolontha hippocastani Fabricius and *M. melolontha* Linnæus; Europe; larvæ attack roots of seedlings.

Cerambycidæ.

Æolesthes sarta Solsky; India; bores in *Populus alba* and *P. euphratica*. (See pl. XXXV.)

Lamia textor Linnæus; Europe; bores in bark and larger cuttings of poplar and aspen.

Saperda carcharias Linnæus, *S. scalaris* Linnæus and **S. populnea*, Linnæus; Europe; bore in branches and trunk. The latter occurs on our Pacific Coast. (See text fig. 86.)

Xylotrechus rusticus Linnæus; Russia; bores in bark and sapwood.

Purpuriiscenus wachanrui Levrat; Baluchistan; bores in *Populus ciliata*.

Chrysomelidæ.

**Phyllodecta vitellinæ* Linnæus; Europe, America; leaf beetle. (See Willow.)

Crepidodera aurata Marsham; Europe; leaf beetle on *Populus laurifolia* and *P. alba*. (See Willow.)

Curculionidæ.

Orchestes salicis Linnæus; Europe; mines the leaves.

Orchestes populi Fabricius; Europe; mines the leaves of *Populus nigra* and *P. dilatata*.

**Cryptorhynchus lapathi* Linnæus; Europe, Eastern United States; breeds in the stems and twigs.

Ipidæ.

Xyleborus cryptophagus Ratzeburg; Germany; ambrosia beetle of poplar and aspen.

LEPIDOPTERA.

Cossidæ.

Cossus cossus Linnæus, goat moth; Europe; bores in wood. (See Willow.)

**Zeuzera pyrina* Linnæus; Europe; bores in wood. (See Horse-chestnut.)

Geometridæ.

Hibernia aurantiaria Esp., *H. defoliaria* Linnæus and *H. marginaria* Borkh.; Europe; defoliators.

Lasiocampidæ.

Eriogaster lanestris Linnæus, and *Malacosoma neustria* Linnæus; Europe; defoliators.

Lymantriidæ.

**Euproctis chrysorrhæa* Linnæus, **Lymantria monacha* Linnæus, **Porthetria dispar* Linnæus, *Porthesia similis* Fuessly, *Stilpnotia salicis* Linnæus; Europe; defoliators. (See Forest defoliators.)

Sesiidæ.

Sciopteron tabaniformis Rott.; Europe; bores in base of trunk.

HYMENOPTERA.

Cimbicidæ.

Cimber variabilis Klug, sawfly; Europe; attacks leaves, and adults girdle twigs.

Pseudoclavellaria amerinæ Linnæus, a sawfly; Europe; attacks foliage.

Tenthredinidæ.

Nematus (Cræsus) septentrionalis Linnæus and *Trichiocampus viminalis* Fallen; Europe; sawflies.

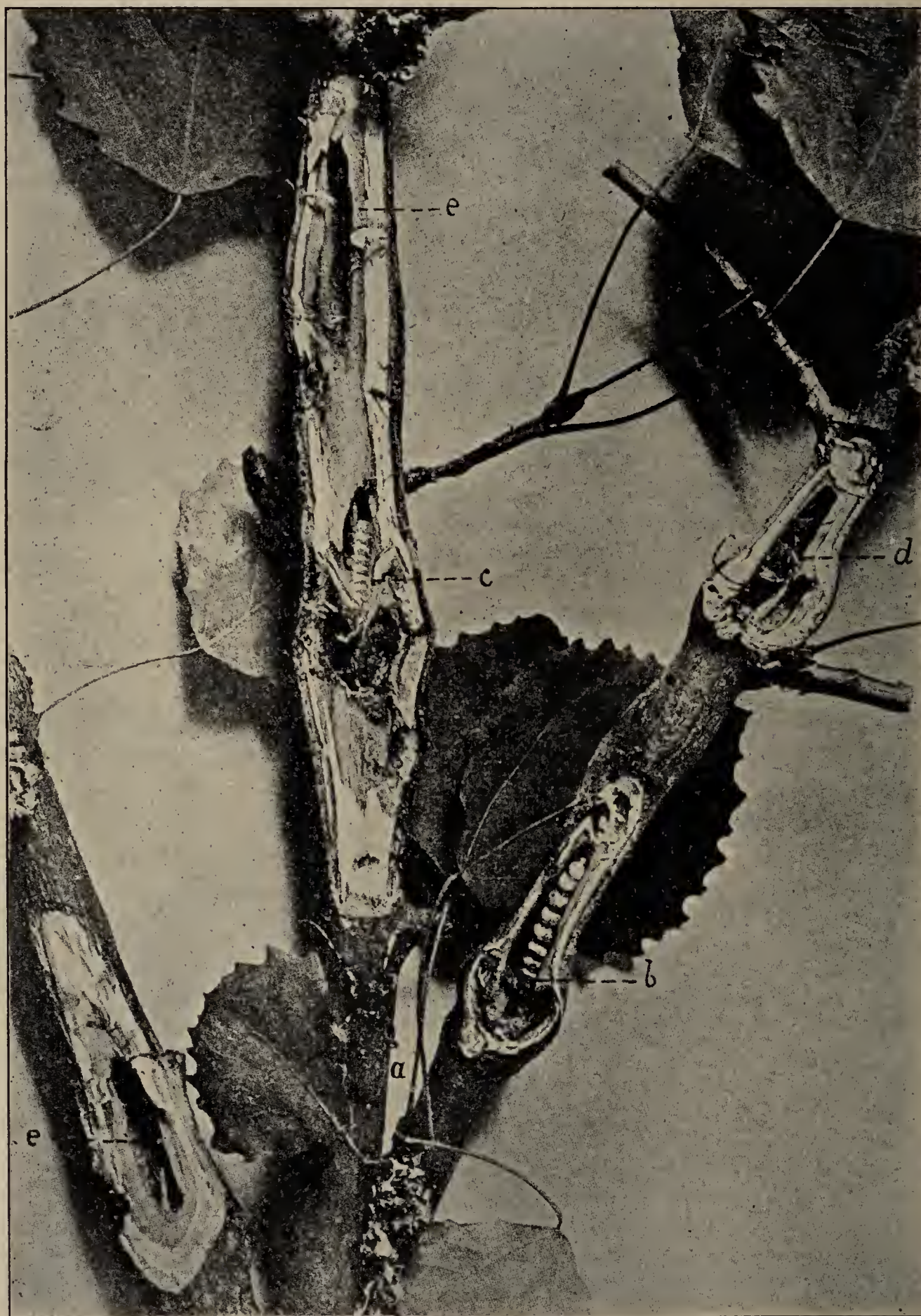


FIG. 86.—Poplar borer (*Saperda populnea*): Branch of aspen with galls containing larva, pupa, and adult. (Barbey.)

DIPTERA.

Itonididæ (Cecidomyiidæ).

Rhabdophaga saliciperda Dufour; Europe; attacks *Populus alba*. (See Willow.)

LITERATURE.

- SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.
 NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed., 1913.
 HESS, R. Der Forstschutz, 1898, 1900.
 STEBBING, E. P. Indian Forest Insects. Coleoptera, 1914.
 BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-1887.
 LINDINGER, L. Die Schildläuse (Coccidæ), 1912.

POTATO.

(*Solanum tuberosum* Linnæus. Family Solanaceæ.)

Although we grow many potatoes in the United States there has been a very large importation trade with other countries. Owing to the danger of introducing certain diseases especially, the Federal Horticultural Board has placed restrictions on the importation of potatoes. There are a number of important insect pests which need to be guarded against almost as closely as the diseases.

A. BETTER KNOWN POTATO INSECTS LIKELY TO BE IMPORTED.* **Rhizoglyphus (Coepophagus) echinopus** F. and R.

(Potato Root Mite. Tyroglyphidæ; Acarina.)

Hosts: Potato, parsnip, tulips, lilies, orchids, and many weeds.

Injury: Very destructive to roots and tubers.

Description and biology: A very tiny mite which breeds in roots and is quite destructive. It may readily be transported with root crops.

Distribution: France, Italy, Portugal, Palestine, Chile, Australia, California.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 109-111, figs. 82-86.

Epilachna spp.

(Potato Ladybird Beetles. Coccinellidæ; Coleoptera.)

Species: *E. 28-maculata* Motschulsky; China; potatoes, *Solanum* spp. *E. 28-punctata* Fabricius; Asia, Malaysia, Australia; Solanaceæ, Cucurbitaceæ. *E. dodecastigma* Mulsant; Asia, Malaysia, Australia; Solanaceæ Cucurbitaceæ. *E. territa* Mulsant; Java; Spanish peppers, Solanaceæ. *E. pusillanina* Mulsant; Java, Solanaceæ. *E. phyto* Mulsant; Java; Solanaceæ. *E. guttato-pustulata* Fabricius; Australia; potato.

Injury: Attack foliage in larval and adult stage.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 2d ed., 1913, vol. 3, p. 477.

Rhigopsidius tucumanus Heller.

(Argentine Potato Weevil; Psaliduridæ [Byrsopidæ]; Coleoptera.)

Host: Potato.

Injury: Bores in potato, making it unfit for use. Has been received alive in the United States in South American potatoes.

Description and biology: Adult weevil, light brown or grayish, with roughened elytra and short broad beak which rests in a deep groove in front of the anterior legs. Length 9 mm. Pupa white with rudiments of all appendages folded on the underside. Found in the potato. Larva white legless with chitinated brownish yellow head. Bores in the tubers. (See plate xxxvi.)

Distribution: Argentina, Peru, Bolivia, Chile.

PIERCE, W. DWIGHT. Journ. Agr. Research, vol. 1, No. 4, pp. 350, 351, pls. 39-40.

Premnotypes solani Pierce.

(Peruvian Potato Weevil. Brachyrhinidæ [Otiiorhynchidæ]; Coleoptera.)

Host: Potato.

Injury: Bores in the tubers. Has been received alive in the United States in potatoes from Peru.

Description and biology: *Adult* weevil bronzy brown somewhat tuberculate with the thorax narrower than the elytra; beak moderately long. Length 7 mm. *Pupa* white with rudiments of all appendages folded on the underside. Found in the potato. *Larva* white, legless, with chitimized brownish yellow head. Bores in the tubers. (See plate xxxvii, figs. 1, 2.)

Distribution: Peru.

PIERCE, W. DWIGHT. Journ. Agr. Research, vol. 1, No. 4, pp. 346, 349, text figs. 1, 2; pl. 41, figs. 1, 2.

Trypopremnon latithorax Pierce.

(Peruvian Potato Weevil. Brachyrhinidæ [Otiiorhynchidæ]; Coleoptera.)

Host: Potato.

Injury: Bores in the tubers. Has been received alive in the United States in potatoes from Peru.

Description and biology: *Adult* weevil brown, tuberculate, with a very broad prothorax, scrobes abruptly terminated behind, mandibles with a tooth beneath. Length 6 mm. *Pupa* white with rudiments of all appendages folded on the underside. Found in the potato. *Larva* white, legless, with chitimized brownish yellow head. Bores in the tubers. (See plate xxxvii, fig. 3.)

Distribution: Peru.

PIERCE, W. DWIGHT. Journ. Agr. Research, vol. 1, No. 4, pp. 349-350, text fig. 3; pl. 41, fig. 3.

Hypera (Phytonomus) spp.

(Potato Leaf Weevils. Curculionidæ; Coleoptera.)

Species: *H. variabilis* Herbst; breeds on the leaves of potato, clover, etc., and attacks bean, cabbage, service berries, *Plantago lanceolata*, *Atriplex patula*. *H. crinita* Boheman; Algeria and Tunis; breeds on potato.

Injury: These are potentially important pests. Judging from the ease with which the clover pests of this genus have been imported it is important to guard against these weevils.

Description and biology: Similar in form to the well-known clover-leaf weevil, *Hypera punctata*. The larvæ feed externally on the leaves and pupate in silken cocoons.

B. OTHER IMPORTANT POTATO INSECTS.**HEMIPTERA.****Miridæ (Capsidæ).**

Phytocoris pabulinus Linnæus; Europe; sucks juices of stems.

Jassidæ.

Eupteryx solani Curtis; Europe; injures leaf.

COLEOPTERA.

Bathyscia wollastoni Janson, the pigmy potato beetle; Europe, often a serious pest.

Elateridæ.

Agriotes lineatus Linnæus. (See Tobacco.)

Lacon murinus Linnæus; Europe; wireworm.

Meloidæ.

Zonabris floralis Pallas, *Z. 14-punctata* Pallas, *Epicauta rufidorsum* Goeze and *E. sibirica* Pallas, blister beetles; Europe; very destructive.

Curculionidæ.

Hypera variabilis Herbst; Europe. (See Clover.)

Desiantha nociva Lea; Australia; larvæ and adults destroy young plants. (See Tomato.)

LEPIDOPTERA.

Euchelia jacobææ, the cinnabar moth; Europe, injurious.

Sphingidæ.

Acherontia atropos Linnæus; death's head moth; Europe; larvæ feed on potato. (See text figs. 87, 88.)

Hepialidæ.

Hepialus lupulinus Linnæus; Europe; breeds at roots.

Hepialus humuli Linnæus; Europe. (See Hops.)



FIG. 87.—Death's-head hawk-moth (*Acherontia atropos*): Adult somewhat reduced. (Kirby.)

Noctuidæ.

**Hydræcia micacea* Esp.; the rosy rustic; Europe, Canada; potato-stalk borer.

Gortyna ochracea Hübner; Europe; stalk borer.

Gortyna flavago Newman; Europe; stalk borer.

Persectania evengi, Australia; climbing cutworm.

Agrotis spina, Bugong moth; Australia; cutworm.

Euxoa radians, Australia; cutworm.

Euplexis nigerrima, Australia; cutworm.

Pyalidæ.

Lineodes ochracea.

Pachyzancla phæopteralis, Bermuda.

DIPTERA.**Sapromyzidæ.**

Lonchæa splendida Loew, New Zealand, Australia, Oceanica. (See Tomato.)

PRICKLY PEAR; TUNA; BARBARY FIG.

(*Opuntia* spp. Family Cactaceæ.)

The common broad-leaved cacti or prickly pears often yields edible fruit.

IMPORTANT PRICKLY-PEAR INSECT.

DIPTERA.

Trypetidæ.*Ceratitis capitata* Wiedemann; attacks *Opuntia tuna*, and *O. vulgaris*. (See Fruit.)**PURSLANE.***(Portulaca oleracea. Family Portulacaceæ.)*

LEPIDOPTERA.

Low, fleshy, perennial or annual herbs mostly American. The purslane is cultivated for its edible foliage. Other species are cultivated for their flowers.

IMPORTANT PURSLANE INSECT.

LEPIDOPTERA.

Pyralidæ.**Hellula undalis* Fabricius; Europe, Australia, parts of United States. (See Cabbage.)FIG. 88.—Death's-head hawk-moth (*Acherontia atropos*): Larva. (Kirby.)**QUINCE.***(Cydonia oblonga, etc. Family Rosaceæ.)*

Ornamental shrubs and trees from Asia now widely cultivated. *C. oblonga*, the quince, yields a fruit used in preserves. *C. japonica* is much prized as an ornamental shrub.

IMPORTANT QUINCE INSECTS.

HEMIPTERA.

Coccidæ.*Lecanium rugosum* Signoret; Europe.**Lecanium persicæ* Fabricius; Europe, Australia, California.*Lecanium coryli* Linnæus; Europe.*Aspidiotus (Diaspidiotus) africanus* Marlatt; South Africa.

COLEOPTERA.

Curculionidæ.

- Magdalis barbicornis* Latreille; Europe. (See Apple.)
Magdalis pruni Linnæus; Europe; bores under bark.

LEPIDOPTERA.

Cossidæ.

- Cossus tristis* Dru.; Africa. (See Apple.)

DIPTERA.

Trypetidæ.

- Ceratitis capitata* Wiedemann. (See Fruit.)
Bactrocera tryoni Froggatt; Orient. (See Fruit.)

RADISH.

(*Raphanus* spp. Family Cruciferæ.)

Cultivated root crops native of Europe and Asia. Grown from seed. (See Crucifers.)

A. A RADISH INSECT LIKELY TO BE IMPORTED.

* *Anthomyia radicum* Meigen.

(Radish Fly. Anthomyidæ; Diptera.)

Hosts: *Raphanus* spp. (including radish), *Brassica* spp. (cabbage, etc.).

Injury: Breeds in the roots.

Description and biology: Male fly blackish, female ash gray; scutellum blackish with three black streaks; abdomen light gray, with black medium streak; undersides and face white in male, front triangle and all appendages black; wings clear; length 4.5–5.5 mm. Maggot whitish, 6 mm. long. Pupates in soil.

Distribution: Europe, and has been introduced into North America.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 425.

B. OTHER IMPORTANT RADISH INSECTS.

COLEOPTERA.

Curculionidæ.

- Ceutorhynchus assiniis* Paykull; Europe; breeds in seed pod.
Ceutorhynchus raphini Fabricius; Europe; breeds in stem.
Ceutorhynchus robertii Gyllenhal; Europe; breeds in crown gall on *Raphanus raphanistrum*.

LEPIDOPTERA.

Pyralidæ.

- Evergestis extimalis* Sc. (See Rape.)

RAPE.

(*Brassica napus* Linnæus. Family Cruciferæ.)

An important forage and cover crop; also valuable for the oil compressed from the seed.

A. BETTER KNOWN RAPE INSECTS LIKELY TO BE IMPORTED.

Phyllotreta vittula Redtenbacher.

(Rape and Grain Beetle. Chrysomelidæ; Coleoptera.)

Hosts and injury: Mines leaves of *Setaria*; adults feed on beets and rape (Hungary); larva in base of stems of barley, rye, and wheat, causing much damage (Scandinavia; Russia).

Description: Beetle striped with yellow.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 525.

Psylliodes chrysocephala Linnæus; **Psylliodes napi** Fabricius.

(Rape Flea Beetles. Chrysomelidæ; Coleoptera.)

Hosts: Crucifers, rape, cabbage, etc.

Injury: Adults feed on foliage, flowers, and fruit.

Biology: Eggs are laid in the leaf axils. Larvæ bore into stem and roots. Breed continuously through season.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 523.



Evergestis extimalis Sc.

(Rape Seed Worm. Pyralidæ; Lepidoptera.)

Hosts: Rape, radish, cabbage.

Injury: Feeds on the seed, spinning a web among the fruiting heads.

Description and biology: Moth, wing expanse 26 mm., forewings light yellow ochraceous, with two rusty-brown transverse lines, violet-gray fringe. Larva yellowish green, with lateral gray stripe and four dorsal rows of dark-brown spots; head and thoracic shield black; 18 mm.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 308.

B. OTHER IMPORTANT RAPE INSECTS.

COLEOPTERA.

Nitidulidæ.

Meligethes æneus Fabricius; Europe; larvæ feed on young shoots.

Curculionidæ.

Ceutorhynchus assimilis Paykull; Europe; breeds in fruit.

**Ceutorhynchus quadridens* Panzer; Europe; Long Island, N. Y. breeds in roots.

Ceutorhynchus sulcicollis; Europe; forms galls on roots. (See text fig. 89.)

LEPIDOPTERA.

Heplalidæ.

Hepialus humuli Linnæus; Europe. (See Hops.)

DIPTERA.

Itonididæ.

Dasyneura brassicæ Winner; Europe; attacks fruit. (See Cabbage.)

RASPBERRY.

RATTAN.

(*Calamus* spp. Family Palmaceæ.)

Palms of tropical Asia, some of which are used to furnish rattan canes. They make excellent conservatory plants.

IMPORTANT RATTAN INSECTS.

COLEOPTERA.

Lyctidæ.

Lyctus brunneus Stephens; Europe, Australia; bores in furniture and sapwood on unseasoned timber

LITERATURE.

FROGGATT, W. W. Australian Insects, 1907.

FIG. 89.—Galls of *Ceutorhynchus sulcicollis* on rape. (Ritzema Bos.)

RHUBARB.

(*Rheum rhaponticum*, etc. Family Polygonaceæ.)

Robust perennial herbs originating in Asia and Russia. The rhubarb plant has been developed into several garden varieties. Propagated by root division or from seed.

IMPORTANT RHUBARB INSECTS.

COLEOPTERA.

Chrysomelidæ.

Chætocnema concinna Marsh; flea-beetle; Europe. *Phyllotreta nemorum* Linnæus; Europe. (See Crucifers.)

Curculionidæ.

Hypera rumicis Linnæus; Europe; breeds on leaves.

RICE.

(*Oryza sativa* Linnæus. Gramineæ.)

Rice is still an important product for importation in spite of the steadily increasing production in our own country. The principal sources of importation are Japan, China, India, Mexico, and Honduras. The danger of importing rice insects is two-fold, through the grain itself, husked or unhusked, and its original containers, and through rice stalks used in packing fragile articles of commerce. The similarity of rice and grain insects lends importance to any rice pest introduced into the United States.

A. RICE INSECTS LIKELY TO BE IMPORTED.

Schoenobius bipunctifer Walker.

(Rice Stem Borer. Lepidoptera.)

Host: Rice.

Injury: Bores in stalks, causing infertility.

Description and biology: *Adult moth*, straw-yellow color, the forewings having one black dot on each. Body about one-half inch in length, wing expanse about 1 inch. *Pupa* in silken case in straw. *Larva* bores in the stalk and remains in the stubble from November to June. *Eggs* laid in clusters on the leaves, covered with hairs; hatch in a week.

Distribution: India.

S. K. BASU and H. L. DUTT. Crop Pest Handbook for Behar and Orissa, 1913. Dept. Agr. Behar and Orissa, Calcutta, leaflet 6, pl. 6.

Chilo auricillia Dudgeon.

(Rice Stem Borer. Pyralidæ; Lepidoptera.)

Host: Rice, sorghum, corn, sugar cane, *Pennisetum*.

Injury: Bores in stems of grasses.

Description and biology: *Adult moth* with metallic spots on fore wings. *Larva* whitish with black head, thoracic shield and setigerous spots, and with purplish brown stripes.

Distribution: India.

MAXWELL-LEFROY, H. F. Mem. Dept. Agric. India. Ent. Ser., vol. 1, pt. 2, p. 197.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 1913, 3d ed., vol. 3, p. 316.

B. OTHER IMPORTANT RICE INSECTS.

The rice plant has many pests which attack the leaves, stalks, and roots, but which are not very likely to be imported. It is, however, of importance to briefly mention these in view of unforeseen possibilities of importation.

ORTHOPTERA.

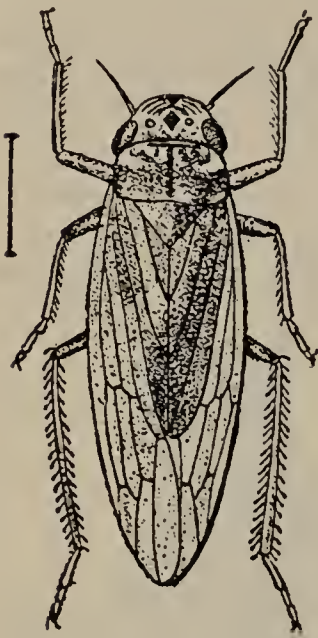
Acridiidae and Locustidae.

Hieroglyphus banian Fabricius; India. (See Pl. XXXVIII.)

Xiphidium varipenne; Hawaii.

Oxya velox Fabricius; Hawaii, Formosa.

Oxya intricata Stål, and *Racilia okinawensis* Matsumura; Formosa and Orient.



Gryllotalpidae.

Gryllotalpa africana Beauvais; Hawaii, Africa, Formosa, Asia, Australia, New Zealand.

HEMIPTERA.

Jassidae, Cercopidae and Fulgoridae.

Deltocephalus dorsalis Motschulsky; Formosa.

Tettigoniella spectra Distant; India. (See text fig. 90.)

Zygina subrufa Motschulsky and *Ptyelus costalis* Walker; Formosa.

Dictyophora sinica Walker, *Dioscimbos politus* Uhler, *Nisia atrovirens* Lethierry, *Delphax furcifera* Horvath, *Zygina maculifrons* Motschulsky, *Cicadula fasciifrons* Stål, *C. 6-notata* Fallen, *Nephotettix apicalis* Motschulsky, and *Tetigonia viridis* Linnæus; Formosa and Orient.

Capsidae.

Lygus oryzae Matsumura; Formosa, Orient.

Coreidae.

Leptocorisa varicornis Fabricius; Japan, China, India, Philippines, Ceylon. (See text fig. 91.)

Pentatomidae.

Aenaria lewisi; Japan.

Plantia affinis Dallas; New South Wales.

COLEOPTERA.

Cucujidae.

Lamotmetus rhizophagoides Walker; Ceylon, Germany; injures dry rice and grain.



FIG. 91.—Rice bug (*Leptocorisa varicornis*): Adult. (Maxwell-Lefroy.)



FIG. 92.—Rice leaf-beetle (*Hispa aenescens*): Adult. (Maxwell-Lefroy.)

Scarabaeidae.

Anomala vitis Fabricius; India; root borer.

Phyllognathus dionysius Fabricius; India; root destroyer. (See Pl. XXXIX.)

Chrysomelidae.

Hispa aenescens Baly; Assam, Burma, Bengal, Malabar. (See text fig. 92.)

Hispa callicantha; Japan.

Chrysomelidæ—Continued.

Chaetocnema basalis Baly; India; flea-beetle. (See text fig. 93.)

Lema flavipes Suffrian; Japan.

Curculionidæ.

Echinocnemis squameus Billberg; Formosa; root weevil.

Hypomeces unicolor Fabricius; Java.

LEPIDOPTERA.

Pyralidæ.

Chilo simplex Butler; India, Formosa. (See Sugar cane.)

Nymphula depunctalis Guénée; rice case bearer; India, Burma, Ceylon, Java, Australia; feeds on leaves. (See pl. XL.)

Nymphula fluctuosalis Zeller; India.

Melissoblaptes gularis Zeller; Japanese grain moth; Japan, England; larvæ injure stored rice.

Noctuidæ.

Prodenia litura Fabricius; India, Egypt; the cotton worm.

Spodoptera mauritia Boisduval; Africa, Asia, Australia; army worm.

Nonagria inferens Walker; Formosa, Orient.

Hesperidæ.

Parnara mathias Fabricius; India; the rice skipper. (See pl. XLI.)

Galleriidæ.

Paralipsa modesta Butler; Japan, Hawaii; larvæ injure stored rice.



FIG. 93.—Rice flea-beetle (*Chaetocnema basalis*): a, Adult, b, head, enlarged; c, hind leg, enlarged. (Maxwell-Lefroy.)

ROSE.

(*Rosa* spp. Family Rosaceæ.)

Ornamental deciduous shrubs bearing beautiful flowers, much imported in nursery stock.

A. AN IMPORTANT ROSE INSECT LIKELY TO BE IMPORTED.

Adoretus umbrosus Fabricius and its var. *tenuimaculatus* Waterhouse.

(The Japanese Rose Beetle. Scarabæidæ; Coleoptera.)

Hosts: Rose trees, citrus, grape, cotton, sugarcane.

Injury: Injurious to citrus, rose, grape, etc., in Hawaii, Rose trees in Fiji, and sugar cane in Java, devouring the foliage. The larvæ feed at the roots. May be introduced in the soil.

Biology: The adult is nocturnal in habit, hiding beneath the soil in the day and emerging in swarms at night. Larval stage, 17 days, pupal stage about 10 days, and egg stage from 6 to 8 days.

Distribution: Hawaii, Fiji, Japan, Java.

FULLOWAY, D. T. Hawaii Agr. Exp. Sta. Bull. 18, p. 11.

B. OTHER IMPORTANT ROSE INSECTS.

HEMIPTERA.

Coccidæ.

Unarmored—

Lecanium pulchrum Marchal; Germany, *Rosa arvensis*.

Lecanium perornatum Cockerell and Parr.; Austria; *Rosa canina*.

Coccidæ—Continued.

Unarmored—Continued.

Icerya montserratensis Riley and Howard; Trinidad, Jamaica, Panama, Colombia, Nicaragua, Porto Rico.

Icerya seychellarum Westwood; China, Mauritius, Natal, England.

Lecaniodiaspis sardoa Targioni; Algeria.

Rhizæcus falcifer Künckel; Algeria, Sicily.

Armored—

**Leucaspis japonica* Cockerell; *Rosa lævigata*. Has been introduced and is established in the United States.

Aspidiotus (Pseudaonidia) articulatus Morgan; Peru.

Aspidiotus (Chrysomphalus) dictyospermi pinnulifera Maskell; Sicily, Italy, etc.

Parlatoria calianthina Berlese and Leonardi; Italy.

Parlatoria proteus virescens Maskell; China, Japan, Formosa.

Aspidiotus (Pseudischnaspis) bowreyi Cockerell; St. Thomas.

Aspidiotus tayabanus Cockerell; Philippine Islands.

THYSANOPTERA.

**Heliothrips rubrocinctus* Giard; West Indies, Ceylon, Uganda, Florida. (See Fruit.)

COLEOPTERA.

Buprestidæ.

Agrilus viridis Linnæus; Europe; breeds in stalks. (See Oak.)

Chrysomelidæ.

Haltica quercetorum Foudr.; Europe; attacks tea rose. (See Oak.)

Cerambycidæ.

Vesperus strepens Fabricius; France. (See Grape.)

Brachyrhinidæ.

Diaprepes abbreviatus Linnæus; West Indies. (See Sugar cane.)

LEPIDOPTERA.

Geometridæ.

Anisopteryx æscularia Schiffermiller; Europe; feeds on foliage.

Hibernia defoliaria Linnæus; Europe; defoliator.

Boarmia gemmaria Brahm.; Europe. (See Grape.)

Laslocampidæ.

Malocosoma neustria Linnæus; Europe; defoliator.

Lymantriidæ.

Dasychira pudibunda Linnæus and *Euproctis chrysorrhœa* Linnæus; Europe; defoliators. (See Forest defoliators.)

Notodontidæ.

Phaleræ bucephala Linnæus; Europe. (See Forest.)

Tortricidæ.

Notocelia roborana Treitschke; Europe. (See Gooseberry.)

Pyralidæ.

**Pionea ferrugalis* Hübner; Europe, Asia, North America. (See Cabbage.)

HYMENOPTERA.

Cephididæ.

Janus luteipes Lep., sawfly, boring in stems; Europe.

Argidæ.

Arge rosæ Linn., sawfly feeds on foliage; Europe.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

ROYAL PALM.

(*Oreodoxa regia*. Family Palmaceæ.)

An American palm of magnificent growth. (See Palms.)

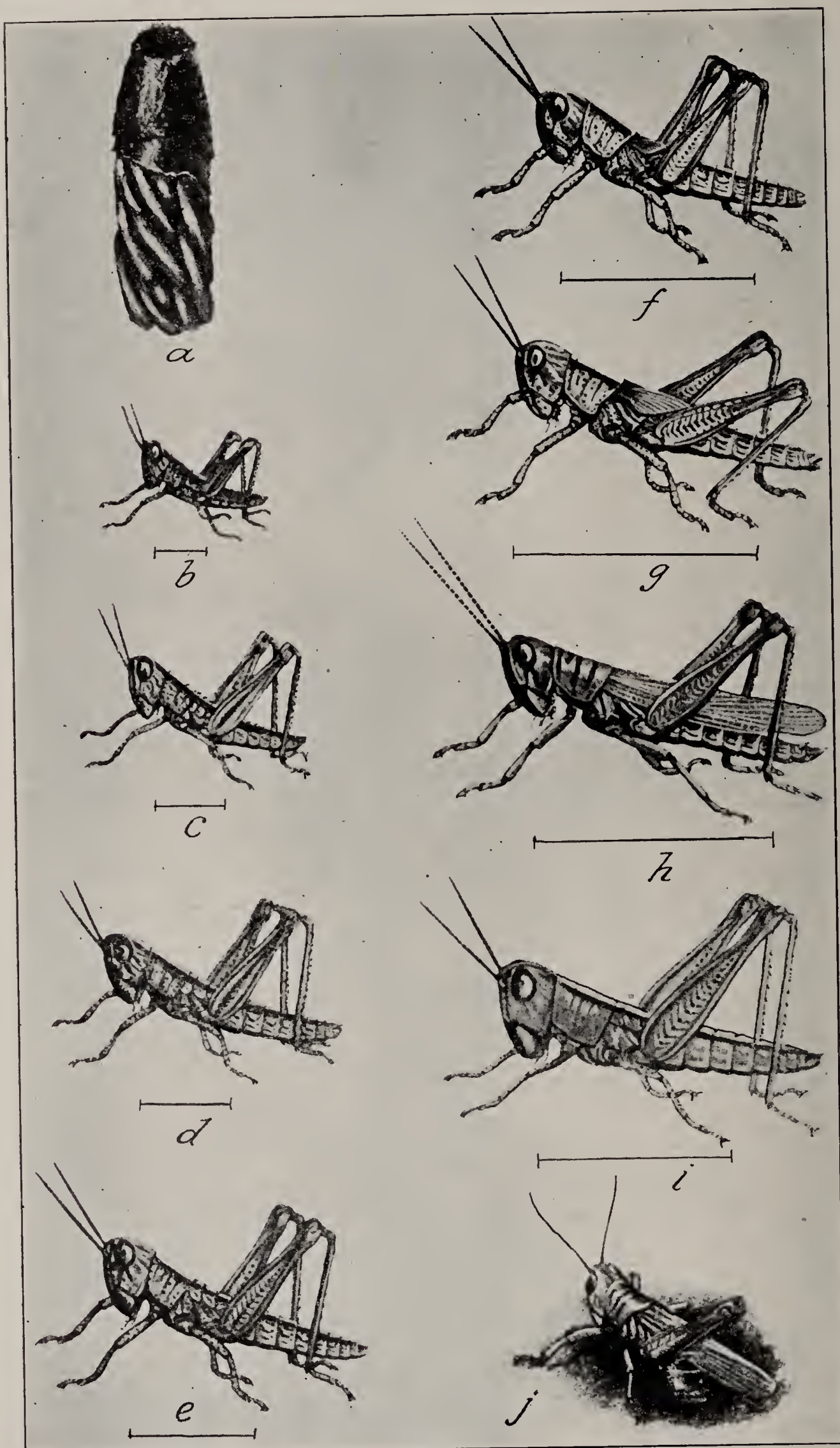
RUBBER.

See Balota gutta percha; Fig (*Ficus* spp.); Ceara rubber; Panama rubber; Para rubber; Silk rubber; West African rubber.



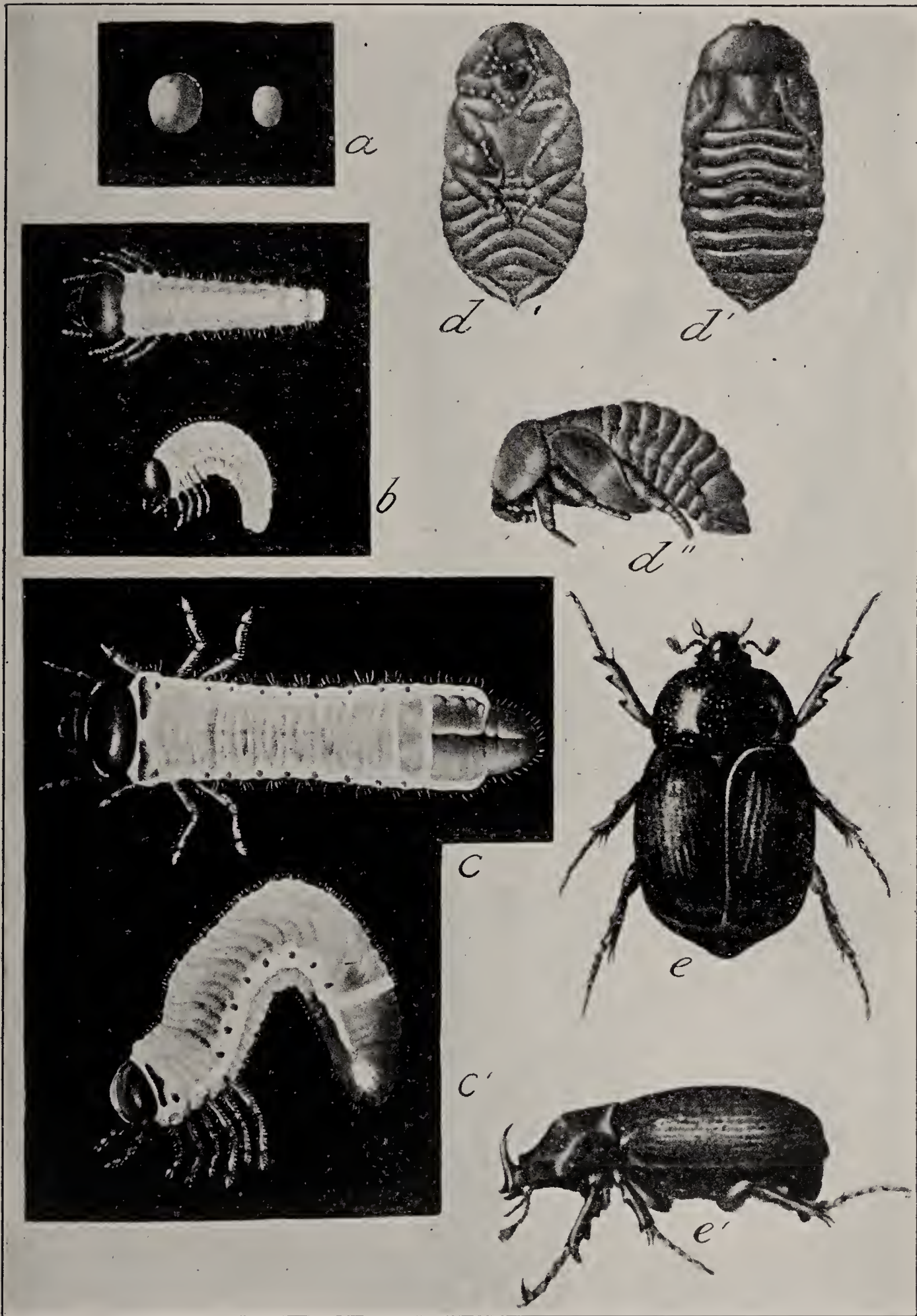
POTATO WEEVILS.

FIGS. 1, 2 *Premnotrypes solani*. FIG. 3, *Trypopermnon latithorax*. Pierce.)



A DESTRUCTIVE RICE GRASSHOPPER.

The rice grasshopper (*Hieroglyphus banian*): a, Eggs; b-q, immature stages; h, adults; j, female laying eggs. (Maxwell-Lefroy.)



THE RICE ROOT GRUB.

Rice root grub (*Phyllognathus dionysius*): *a*, Eggs; *b*, *c*, *c'*, larvæ; *d*, *d'*, *d''*, pupæ; *e*, *e'*, adults. (Maxwell-Lefroy.)



THE RICE CASE-BEARER.

The rice case-bearer (*Nymphula depunctalis*): *a*, Larva; *b*, pupa; *c*, pupa in cocoon; *d*, adult; *e*, *e'* larvæ feeding, in cases; *f*, *f'*, cocoon stems; *g*, *g'*, larval cases. (Maxwell-Lefroy.)



THE RICE SKIPPER.

The rice skipper (*Parnara mathias*): a, Eggs; b, larva webbing leaf; c, full grown larva; c', pupa; d, d', d'', adults; e, e', puparia of Tachinid flies; f, Ichneumonid parasite; g, g'', Tachinid parasite. (Maxwell-Lefroy.)

RUTABAGA.

See Turnip.

RYE.

(*Secale cereale* Linnæus. Family Gramineæ.)

This species as well as its near relatives is cultivated in Europe and Asia. For full treatment of its insect pests, see Grains and grasses.

SAGO PALM.

(*Cycas revoluta*. Family Cycadaceæ.)

A palm-like plant of the Orient, much used in this country at funerals. (See Palms.)

SAL.

(*Shorea* spp. Family Dipterocarpaceæ.)

Valuable timber trees of India.

IMPORTANT SAL INSECTS.**COLEOPTERA.****Scarabæidæ.**

Serica assamensis Brenske; India; adults defoliate and larvæ attack the roots of *Shorea robusta*.

Lepidiota bimaculata Saunders; India; adults feed on foliage of *Shorea robusta*.

Phyllophaga problematica Brenske (*Lachnosterna*), and *P. clypealis* Brenske; India; adults defoliate and larvæ attack the roots of *Shorea robusta*.

Heteroplia varians Olivier; India; breeds at roots of *Shorea robusta*.

Cucujidæ.

Læmophlæus testaceus Fabricius; India; breeds under the bark of felled trees of *Shorea robusta*.

Bostrychidæ.

Schistoceros anobioides Waterhouse; India; bores in trees of *Shorea robusta*.

Heterobostrychus pileatus Lesne, and *H. æqualis* Waterhouse; India; bore in timber of *Shorea robusta*.

Sinoxylon crassum Lesne; India; a serious borer in the wood *Shorea robusta*.

Sinoxylon anale Lesne; India; bores in *Shorea robusta*.

Buprestidæ.

Acmæodera stictipennis Laporte et Gory; India; bores in *Shorea robusta*.

Chysobothris sexnotata Gory; India; bores in the bark, bast, and sapwood of branches of *Shorea robusta*.

Psiloptera viridans Kerremans; India; bores in *Shorea robusta*.

Elateridæ.

Alaus sculptus Westwood; India; bores in logs of *Shorea robusta*.

Tenebrionidæ.

Setenis lævis Fairmaire, and *S. semivalga* Blair; India; bore in *Shorea robusta*.

Cerambycidæ.

Acanthophorus serraticornis Olivier; India; tunnels bast and sapwood of *Shorea robusta*.

Cælosterna scabrata Fabricius; India; bores in sapwood of *Shorea robusta*.

Plocæderus obesus Gahan; India; bores in *Shorea robusta*.

Æolesthes holosericea Fabricius; India; bores in *Shorea robusta*.

Dialeges pauper Pascoe; India; bores in bast and sapwood felled and sickly trees of *Shorea robusta*.

Hypoesthrus indicus Gahan; India; bores in sapwood of *Shorea robusta*.

Hoplocerambyx spinicornis Newman; India; bores in wood of sickly or felled trees of *Shorea robusta*.

Xylotrechus smeii Lap. et Gory; India; bores in *Shorea robusta*.

Cossonidæ.

Conarthrus jansonii Wollaston; India; bores in timber of *Shorea robusta*.

Himatium asperum Marshall; India; bores in *Shorea robusta*.

Ipidæ.

Sphærotrypes assamensis Stebbing, *S. globulus* Blandford, *S. siwalikensis* Stebbing, *Coccotrypes integer* Eichhoff, and *Dryocetes minor* Stebbing; India; make galleries in wood and bark of *Shorea robusta*.

Xyleborus fallax Eichhoff, *X. perforans* Wollaston, *X. bengalensis* Stebbing, *X. major* Stebbing,

X. schlichii Stebbing; India; bore in *Shorea robusta*.

Xyleborus andrewesi Blandford; India; bores in *Shorea talura*.

Platypodidæ.

Crossotarsus saundersi Chapuis; India; bores in *Shorea robusta*.

Platypus curtus Chapuis; India; bores in *Shorea robusta*.

Platypus taluræ Stebbing; India; bores in *Shorea talura*.

Diapys furtivus Sampson, *D. quinquespinatus* Chapuis, and *D. mirus* Sampson; India; bores in *shorea robusta*.

LEPIDOPTERA.

Geometridæ.

Boarmia selanaria; India; feeds on young growth, leaves, and flowers.

Lasiocampidæ.

Suana concolor; India; defoliator.

Trabala vishnu; India; defoliator.

Dasychira horsfeldi; India; defoliator.

Leucoma diaphana; India; defoliator.

Lymantriidæ.

Lymantria grandis, *L. lipcha*, and *L. brittata*; India; defoliators.

LITERATURE.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

STEBBING, E. P. A Manual of Forest Zoology for India, 1908.

SAPODILLA.

(*Sideroxylon* [*Achras*] *sapota*. Family Sapotaceæ.)

A fruit-bearing tree of the West Indies, central America, and northern South America, cultivated in southern Florida.

IMPORTANT SAPODILLA INSECTS.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann. (See Fruit.)

Anastrepha ludens Loew; Mexico. (See Fruit.)

SILK COTTON.

(*Bombax malabaricum*. Family Malvaceæ.)

Tropical trees. The bark of some species produces commercial fiber.

IMPORTANT SILK COTTON INSECTS

HEMIPTERA.

Coccidæ.

Aspidoproctus giganteus Newstead; Africa; *Ceiba bombari*.

COLEOPTERA.

Bostrychidæ.

Heterobostrychus æqualis Waterhouse; India; bores in the wood.

LEPIDOPTERA.

Lymantriidæ.

Dasychira horsfeldi; India; defoliator.

Noctuidæ.

Mudaria cornifrons; India; breeds in the pods.

LITERATURE.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

STEBBING, E. P. Manual of Forest Zoology for India, 1908.

SILKY OAK.

(*Grevillea robusta*. Family Proteaceæ.)

A valuable lawn tree with fine fern-leaved foliage, indigenous to Australia, but now cultivated in Florida and California.

IMPORTANT SILKY OAK INSECTS.*Æsiotes notabilis* Pascoe.

(Silky Oak Weevil Borer. Curculionidæ; Coleoptera.)

Hosts: Silky oak (*Grevillea robusta*), and kauri (*Agathis australis*).*Injury:* Bores in wood and is easily transported in logs.*Description:* A beautiful grayish weevil about 0.75 inch long, with brown and pinkish markings, humeri and apical declivities of elytra acute angulate or toothed, thorax and elytra tuberculate.*Distribution:* Queensland, Victoria.

FRENCH, C. Handbook of the Destructive Insects of Victoria, pt. 5, pp. 106-108, pl. 119.

Xenocnema spinipes (Wallach) *australiæ* Lea.

(Spined Log Beetle. Cossonidæ, Coleoptera.)

Hosts: *Grevillea robusta* and *Agathis australis* (*Dammara*).*Injury:* Riddles the wood of logs.*Description:* A small brownish black elongate beetle. Found in large numbers under the bark and when the bark is removed they bore rapidly into the wood.*Distribution:* Queensland, introduced into Victoria.

FRENCH, C. Handbook of the Destructive Insects of Victoria, 1911, pt. 5, pp. 126-128, pl. 124.

SILK RUBBER; IRE.(*Funtumia elastica* [*Kickxia*]. Family Apocynaceæ.)**IMPORTANT SILK RUBBER INSECTS.**

(Silk Rubber Longicorns. Cerambycidæ; Lamiinæ; Coleoptera.)

Species: *Acridocephala bistriata* Chevrolat; East and West Africa; *Funtumia elastica*. *Moecha adusta* Har.; West and East Africa; cacao, *Funtumia*. *Phryneta hecphora* Thoms.; Kamerun, East Africa; *Funtumia elastica*. *Phryneta cæca* Chevrolat; Kamerun; *Funtumia elastica*.*Injury:* Bore in the wood.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 501, 502.

SISSU.(*Dalbergia sissoo*. Family Leguminosæ.)

A tree of India, furnishing a very desirable timber. It is cultivated in California.

IMPORTANT SISSU INSECT.

LEPIDOPTERA.

Noctuidæ.*Plecoptera reflexa* Guénée; India; defoliator.**SORGHUM; KAFIR; DURRA; BROOM CORN.**(*Holcus sorghum* Linnæus. Family Gramineæ.)

Owing to the large number of useful varieties of this species throughout the world there is more or less commerce in the seed for propagation purposes at least. The dangers of importing injurious insects would consist mainly in the shipments of seed, although it is conceivable that boring insects might be introduced in brooms.

IMPORTANT SORGHUM INSECTS.

LEPIDOPTERA.

Pyralidæ.

Chilo simplex Butler; India, Formosa. (See Sugar cane.)

Chilo auricilia Dudgeon; India. (See Rice.)

Noctuidæ.

Sesamia cretica Led.; Sudan; attacks durra. (See Sugar cane.)

SOY BEAN.

(*Glycine hispida* Maxim. Family Leguminosæ.)

The soy bean was introduced into this country from the Orient. Care should be taken to see that seed pests are not introduced.

AN IMPORTANT SOY-BEAN PEST.

Laspeyresia glycinivorella Matsumura (*Grapholitha*).

(Soy Bean Moth. Tortricidæ; Lepidoptera.)

Host: Soy bean.

Injury: Breeds in the pods; very injurious.

Description and biology: Similar to that of *L. nebritana* on peas.

Distribution: Japan.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 284.

SPINACH.

(*Spinacia oleracea*. Family Chenopodiaceæ.)

An annual herb originating in Asia, now much cultivated for its edible foliage.

AN IMPORTANT SPINACH INSECT.

DIPTERA.

Anthomyidæ.

* *Chortophila* (*Pegomya*) *hyoscyami* Panzer (spinach leafminer). (See Beets.)

SPRUCE.

(*Abies* spp., *Picea* spp. Family Pinaceæ.)

Ornamental evergreen trees of the cold and temperate zones of the northern hemisphere, highly valued for shade, parking, wind breaks, and hedges, and valuable for timber. For convenience the insect pests are arranged under Conifers.

STRAWBERRY.

(*Fragaria* spp. Family Rosaceæ.)

Low vines bearing delicious fruit, cultivated in Europe, and America especially.

IMPORTANT STRAWBERRY INSECTS.

HEMIPTERA.

Aphididæ.

Macrosiphum fragariæ Koch; Europe; sucks juices.

Macrosiphum fragariellum Theobald; Europe.

Macrosiphum rogersii Theobald; England.

Pentatomidæ.

Dindymus versicolor; Australia; injurious.

COLEOPTERA.

Carabidæ.

Harpalus ruficornis Fabricius; Europe; attacks fruit.

Pterostichus vulgaris Linnæus; Europe; a wingless beetle, attacks fruit and also feeds on angleworms.

Chrysomelidæ.

Galerucella tenella Linnæus; leaf beetle; Europe; sometimes causes serious damage, larvæ and adults feed on leaves.

Brachyrhinidæ.

Brachyrhinus tenebricosus Herbst; Europe; larva feeds at roots, adults destroy buds and leaves. Several species of this genus have been introduced into the United States.

Brachyrhinus picipes Fabricius; pitchy-legged weevil; Europe; injures strawberry, raspberry, pea, turnip, kale, ferns, potted plants.

Curculionidæ.

Anthonomus rubi Herbst; Europe; larva attacks roots and runners, and adults destroy blossoms, buds and leaves.

Rhinaria perdix Pascoe; Australia.

LEPIDOPTERA.

Psychidæ.

Psyche viciella Schiffermiller; Europe.

LITERATURE.

ORMEROD, E. A. Injurious Insects during 1897, pp. 111-112, 1898.

ORMEROD, E. A. 16th Rept., Injurious Insects, pp. 124-126.

CURTIS, JOHN. Farm Insects, p. 383.

SUGAR BEET.

(See Beet.)

SUGAR CANE.

(*Saccharum officinarum* Linnæus. Family Gramineæ.)

Sugar cane is an important product of the Southern States, Hawaii, Porto Rico, and the Philippines. It is grown in many parts of the world. Owing, however, to the great danger of transporting insect enemies in the seed cane, its importation into the United States, except through the Department of Agriculture, has been forbidden. There is still a great possibility of the spread of its enemies from outside into the islands. Some very important cane insects also attack corn. The sugar cane is host to a multitude of insects which feed on its foliage, suck its juices, or bore in its stems or roots. Many of these insects are not very likely to be imported, but in view of such a possibility are briefly mentioned.

A. SUGAR-CANE INSECTS LIKELY TO BE IMPORTED.

***Tetranychus exsiccator* Zehntner.**

(Sugar-Cane Red Spider. Tetranychidæ; Acarina.)

Host: Sugar cane.

Injury: Sucks juices from the plant.

Description and biology: A tiny red mite similar in structure and habits to our common red spider, *Tetranychus bimaculatus*.

Distribution: Java.

VAN DEVENTER, W. Handboek voor de Suikerriet-cultuur, Java, 1906, vol. 2, pp. 282-287, pl. 39.

***Tomaspis varia* Fabricius; *Tomaspis postica* Walker; *Tomaspis lepidior* Font.**

(Sugar-Cane Frog Hoppers. Cercopidæ; Hemiptera.)

Hosts: Sugar cane, corn, grasses.

Injury: *Tomaspis varia* is a serious pest in Trinidad; damage called "blight" consists of withering of leaves and stunting of stem.

Description and biology: Adult *Tomaspis varia*, leafhopper 6-9 mm. long, with broad front wings; head and prothorax greenish, front wings brown with two yellow bands; undersides dark with sutures pinkish. The adults are not active in the daytime. They fly or hop when disturbed. *Nymphal* stages whitish with pink tinge;

completely covered by spittle within which they suck on the juices of the plant. Eggs elongate, oval, laid separately in incisions in dead or withering cane leaves. The other two species are similar to *T. varia*. (See plate XLII.)

Distribution: *T. varia*, Trinidad; *T. postica*, Mexico; *T. lepidior*, Panama.

URICH, F. W. Board of Agriculture, Trinidad and Tobago. Cir. 9, 1913, 45 pp., 9 pls., 7 text figs.

***Perkinsiella saccharicida* Kirkaldy.**

(Sugar-Cane Leafhopper. Fulgoridæ; Hemiptera.)

Host: Sugar cane.

Injury: Very serious drain on the vitality of the plant due to sucking of the juices. Liable to transportation on seed cane.

Description and biology: A small yellowish leaf hopper differing in the various stages mainly in the development of the wing pads. Eggs laid in slits in the epidermis of the leaves and stalks of cane. The insect in all stages sucks the juices of the plant. (See plate XLIII.)



FIG. 94.—West Indian Cane Fly (*Stenocranus saccharivora*): Adult. (Ballou.)

Distribution: Hawaii, Australia. A large number of this species were captured in quarantine in shipments received at Washington from Hawaii.

VAN DINE, D. L. Hawaii Agric. Exp. Sta., Bul. 5, 1904, 29 pp., 8 figs.

***Stenocranus saccharivora* Westwood.**

(West Indian Cane Fly. Fulgoridæ; Hemiptera.)

Host: Sugar cane.

Injury: Very serious drain on vitality of plant due to sucking juices. Liable to transportation on seed cane.

Description and biology: A little yellow leafhopper differing but little in the various stages. It is not often a serious pest but at times does much damage. (See text fig. 94.)

Distribution: West Indies.

BASSIÈRES, EUGENE. La Sucrerie Indigène et Coloniale, Paris, 1912, vol. 79, pp. 27-32.

***Entochira lateralis* Boheman. (*Holaniara picescens* Fairmaire).**

(The Bibitkever. Tenebrionidæ; Coleoptera.)

Hosts: Sugar cane, tobacco.

Injury: Bores in the stalks, causing much damage. It can easily be transported in seed cane.

Description and biology: Adult beetle about 6 mm. long, black, with a brown metallic luster on the elytra. Pupa white, oval, acute at apex with many spiny tubercles on sides of abdomen. Larva an elongate brown wireworm with pointed apex, 10-11 mm. long. Bores in the stalks of cane near the nodes, and also bores in tobacco stems. Eggs less than 1 mm. long, oval, almost spherical.

Distribution: Java.

VAN DEVENTER, W. Handboek voor de Suikerriet-cultuur, Java, 1906, vol. 2, pp. 53-58, pl. 7.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 494.

Apogonia destructor Ritsema Bos.

(Javan Sugar-Cane Grub Beetle. Scarabæidæ; Coleoptera.)

Hosts: Sugar cane, grasses, and various plants.*Injury:* Destructive in Java. Attacks the roots.*Description and biology:* *Adult* about 0.5 inch long, greenish black, of the general form of a June beetle. *Pupa* white, broad in front, tapering behind, with all appendages beneath. *Larva* white, usually in a curved position, with large yellow head and long legs. Lives at roots of plants, causing much damage.*Distribution:* Java.

VAN DEVENTER, W. Handboek voor de Suikerriet-cultuur Java, 1906, vol. 2, pp. 282-287, plate 4.

Apogonia ritsemæ Sharp.

(Javan Sugar-Cane Grub Beetle. Scarabæidæ; Coleoptera.)

Hosts: Sugar cane, and other plants.*Injury:* Destructive to the roots.*Description and biology:* *Adult* reddish brown to blue-black. Somewhat smaller than *A. destructor*. Length 5-7 mm. Immature stages also similar. The larvæ are very destructive to the roots.*Distribution:* Java.

VAN DEVENTER, W. Handboek voor de Suikerriet-cultuur, Java, 1906, pp. 32, 33, pl. 5.

Phytalus smithi Arrow.

(The Brown Hard-Back Beetle. Scarabæidæ; Coleoptera.)

Hosts: Sugar cane.*Injury:* Larva trims the small roots and is liable to transportation in the soil around cane plants.*Description and biology:* *Adult* beetle tawny red of the shape and appearance of a June beetle, 14-18 mm. long. *Pupation* occurs in a cell in the ground. *Larva* a white grub, usually curved, with large brownish head, and long legs; bores in the sugar-cane stumps. *Eggs* laid in the soil.*Distribution:* Mauritius, Barbados, Trinidad. Has been distributed in cane shipments.

ARROW, G. J. Annals and Mag. Nat. Hist., ser. 8, vol. 9, 1912, pp. 455-459.

Aphanistichus consanguineus Ritsema Bos.

(The Flat-Headed Leaf-Miner Beetle. Buprestidæ; Coleoptera.)

Host: Sugar cane.*Injury:* Mines the leaves.*Description and biology:* *Adult* beetle, 3.5 mm. long, black, head and prothorax with a bronzy tint. *Pupa* 3-5 mm. long, orange color, elongate elliptical, with all appendages beneath. *Larva* when full grown about 6 mm. long, orange colored, elongate, flattened, with sides crenulate. *Eggs* laid singly in the leaf.*Distribution:* Java.

VAN DEVENTER, W. Handboek voor de Suikerriet-cultuur, Java, 1906, vol. 2, pp. 46-53, pl. 6.

Hispa wakkeri Zehntner.

(Sugar-Cane Hispid Miner. Chrysomelidæ; Coleoptera.)

Hosts: Sugar cane.*Injury:* Mines the leaves of sugar cane.*Description and biology:* *Adult* beetle 5-6 mm. long, black, bristling with strong spines. *Pupa* cylindrical, yellow or red brown in color, 6-7 mm. long, formed in

the leaf mine. *Larva* yellowish white, flattened, legless, with small brown head, brown prothoracic shields, and two apical teeth. Mines the leaves.

Distribution: Java.

VAN DEVENTER, W. Handboek voor de Suikerriet-cultuur, Java, 1906, pp. 66-70, pl. 9.

Diaprepes abbreviatus Linnaeus (*spengleri* Linnaeus).

(West Indian Sugar-Cane Root Borer. Brachyrhinidæ [Otorhynchidæ]; Coleoptera.)

Hosts: Sugar cane, orange, guava, avocado, mango, rose, Indian corn, Guinea corn, sweet potatoes, Bahama grass (*Cynodon dactylon*), limes, and other plants.

Injury: The larva does serious injury to the roots and the adult to the foliage. Liable to transmission in seed-cane shipment.

Description and biology: *Adult* 8-18 mm. in length; variable in color from white to green and ochraceous, with from four to many denuded elytral striæ beak thick, tricarinate, antennæ elbowed. *Pupa* 19 mm. long, soft and white with a long thick beak. *Larva* long, white, curved, footless. *Eggs* oblong, oval, smooth, white, laid in clusters on leaves and glued between two leaf surfaces. The larvæ feed at the root system and tunnel the stalk of the plants above named.

Distribution: Porto Rico to Barbados. (See plate XLVIII.)

PIERCE, W. D. On Some West Indian Sugar-Cane Root-Boring Weevils. Journ. Agr. Research, U. S. Dept. Agr., vol. 4, pp. 255-263, 1915 (Plates XXXV to XXXVIII).

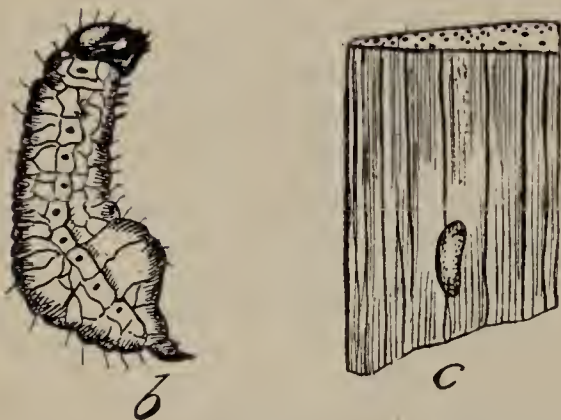


FIG. 95.—Sugar-cane borer (*Metamasius sericeus*): a, Adult; b, larva; c, injury. (Ballou.)

cocoon of fiber. *Larva* pale yellow, with brownish head, legless, wrinkled in appearance with the hind part of the body swollen; bores downward in the cane stalk. *Eggs* laid singly beneath the rind of the stalk or in the leaf sheaths.

Distribution: West Indies, Trinidad.

VAN DINE, D. L. Porto Rico Sugar Growers' Association, 1911, Year Book, pp. 55-56.

Metamasius sericeus Olivier.

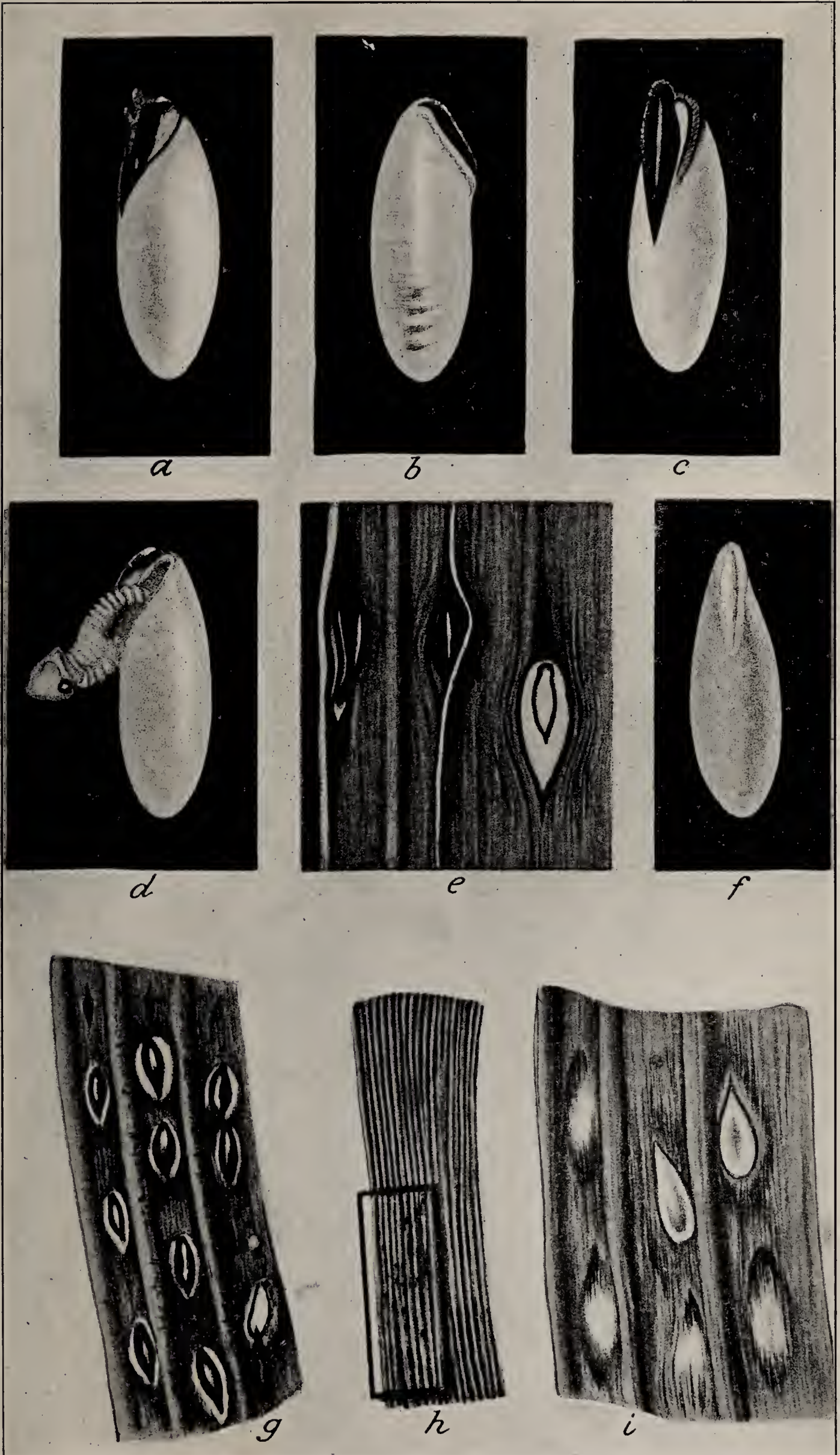
(Sugar-Cane Borer. Calandridæ; Coleoptera.)

Host: Sugar cane.

Injury: Serious pest to cane stalks. Liable to importation in seed cane.

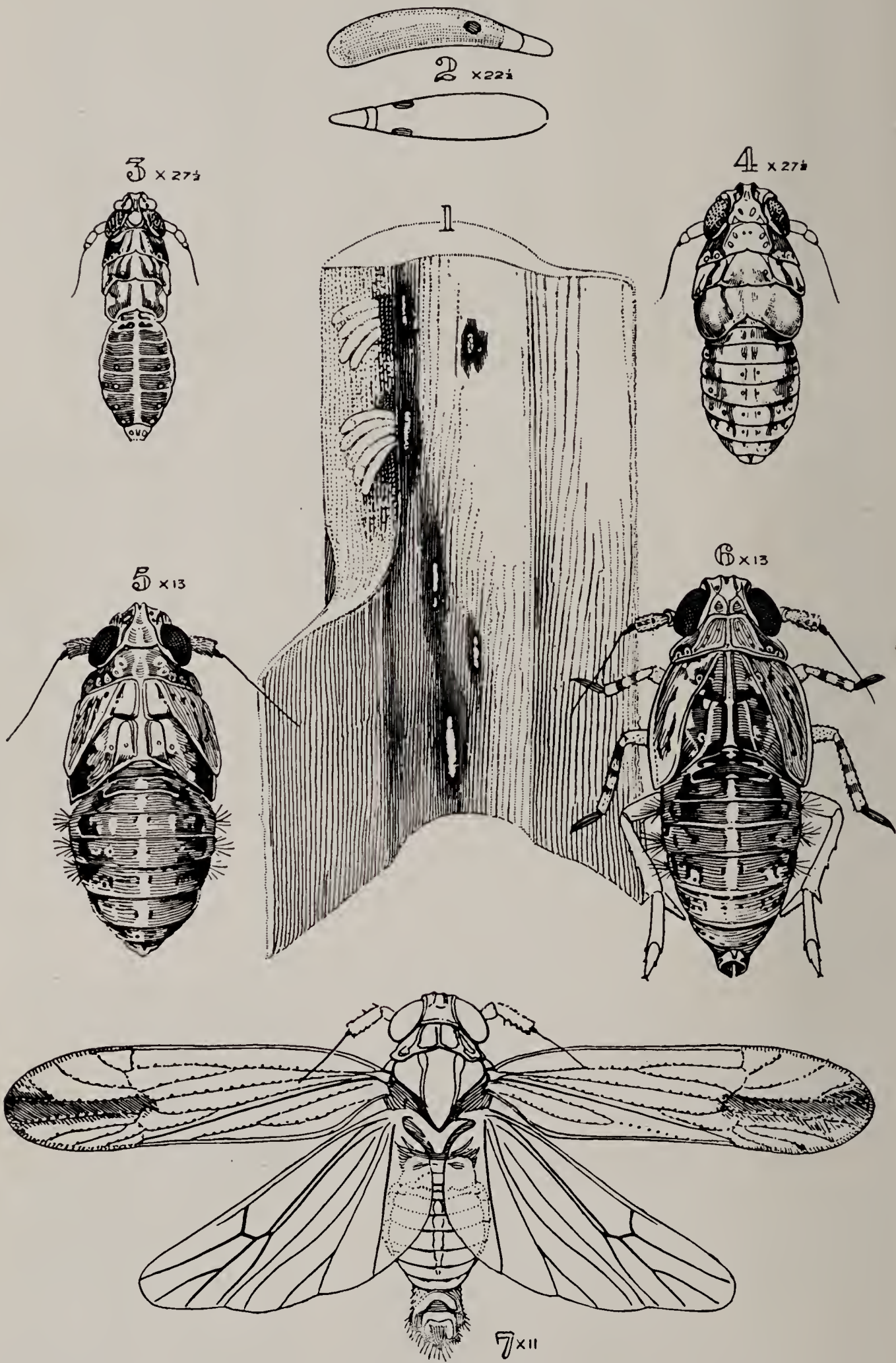
Description and biology: Very similar in general appearance and habits to *Metamasius hemipterus* Linnaeus. (See text fig. 95.)

Distribution: West Indies.

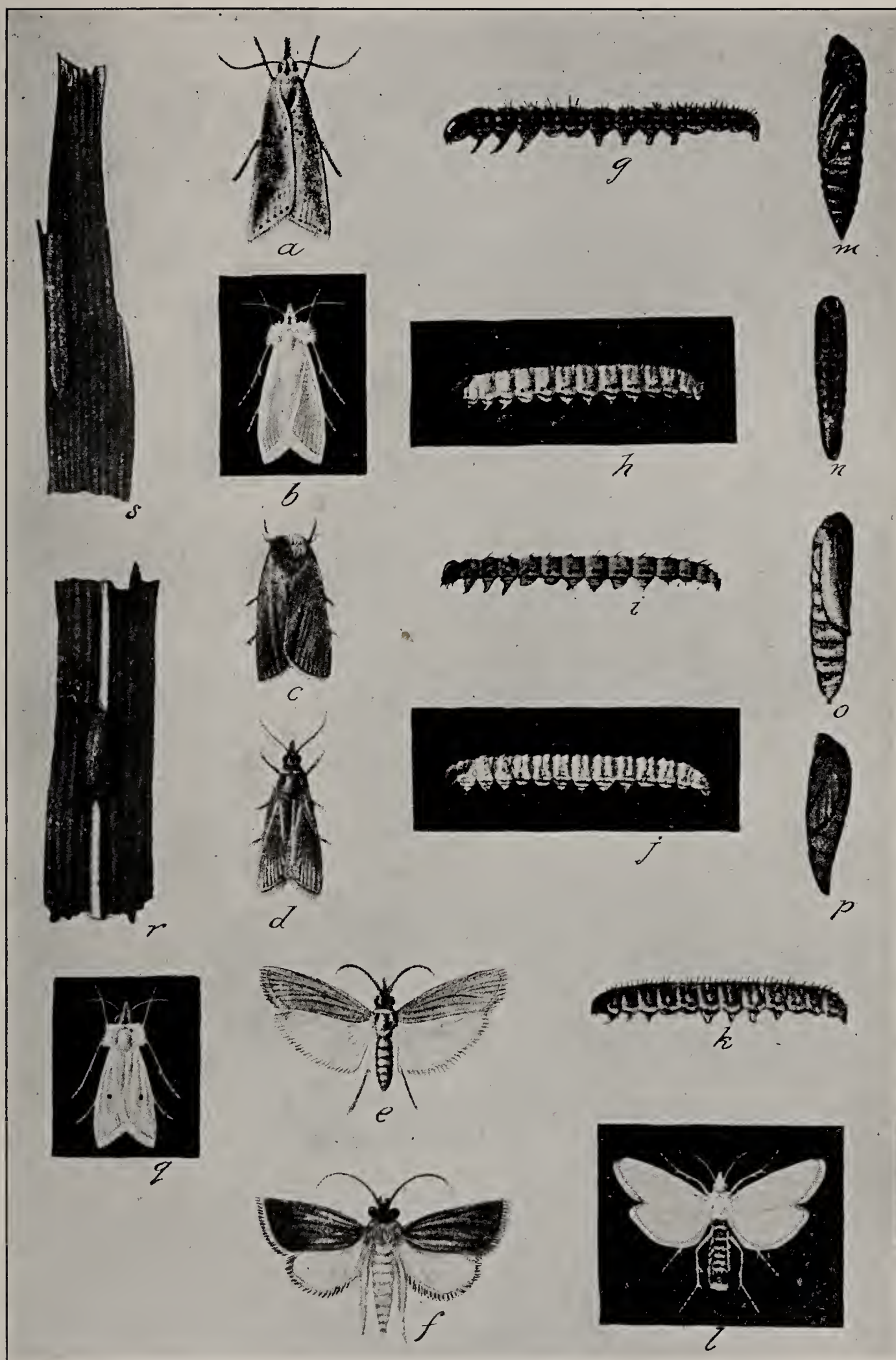


THE SUGAR-CANE FROGHOPPER.

The sugar-cane frog hopper (*Tomaspis varia*): Eggs, and egg punctures. (Urich.)

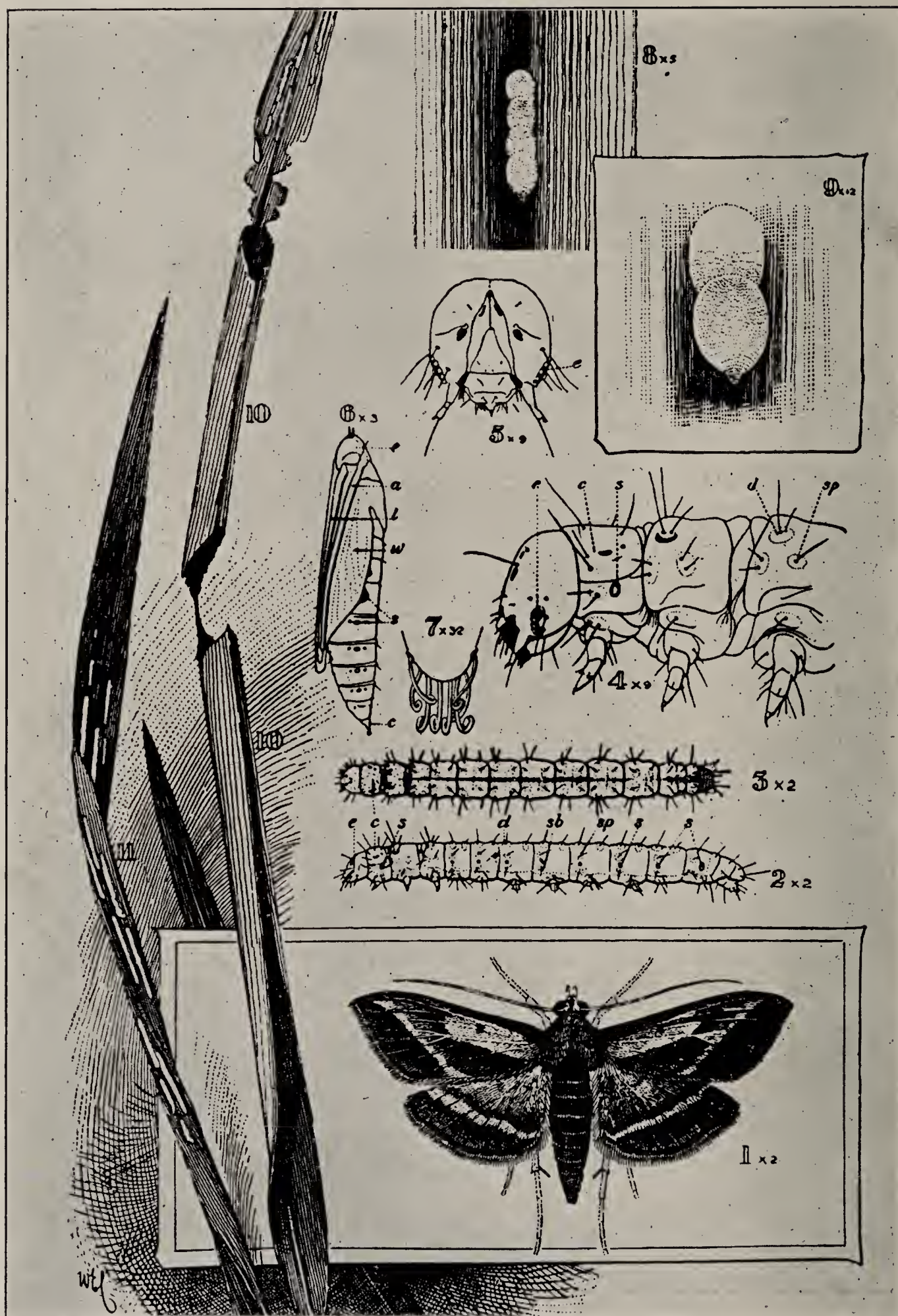


THE SUGAR-CANE LEAFHOPPER (*PERKINSIELLA SACCHARICIDA*). (KIRKALDY.)



CANE BORERS.

Cane borers. Figs. a, g, m, s.—*Chilo simplex*: Eggs, larva, pupa, adult. Figs. b, h, l, n, r.—*Scirpophaga auriflua*: Egg, larva, pupa, adults. Fig. g.—*Scirpophaga monostigma*: Adult. Figs. c, f, i, o.—*Nonagria uniformis*: Larva, pupa, adults. Figs. d, j, p.—*Polyocha saccharella*: Larva, pupa, adult. Figs. e, k.—*Anerastia ablutella*: Larva, adult. (Maxwell-Lefroy.)



THE SUGAR-CANE LEAF-ROLLER.

The sugar-cane leaf-roller (*Omiodes accepta*): FIG. 1.—Adult. FIGS. 2, 3, 4, 5.—Larva. FIGS. 6, 7.—Pupa. FIGS. 8, 9.—Eggs. FIGS. 10, 11.—Injury. (Swezey.)

***Rhabdocnemis obscurus* Boisduval.**

(Hawaiian Sugar-Cane Borer. Calandridæ; Coleoptera.)

Hosts: Banana, sugar cane, coconut, sago palm, royal palm, wine palm (*Caryota urens*), papaya (*Carica papaya*).

Injury: Very injurious to the stalk. Liable to importation in seed cane.

Description and biology: Adult weevil reddish brown with darker brown markings,

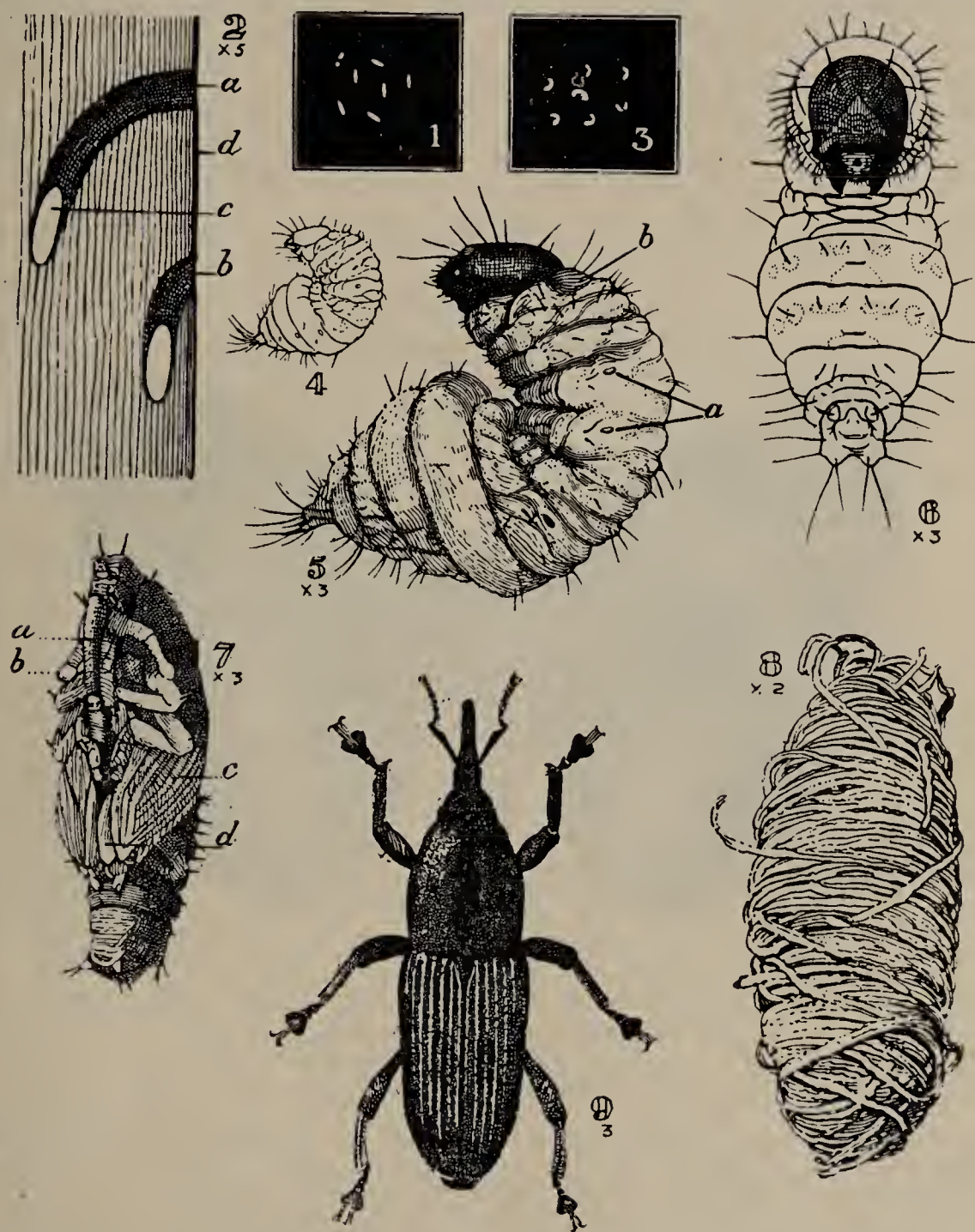


FIG. 96.—The Hawaiian sugar-cane borer (*Rhabdocnemis obscurus* [*Sphenophorus*]): 1, Eggs, natural size. 2, Eggs in situ, much enlarged: *a*, Section of egg passage with egg, *c*; *b*, egg placed unusually near the rind, *d*. 3, Larvæ, just hatched and older, natural size. 4, Full-grown larva, natural size. 5, Larva, side view, enlarged: *a*, Spiracles; *b*, cervical shield. 6, Larva, front view, enlarged. 7, Pupa, enlarged: *a*, Rostrum or beak; *b*, antenna; *c*, elytron or wing cover; *d*, folded wing. 8, Pupal case or cocoon, enlarged. 9, Adult, enlarged. (Terry.)

long beak, elbowed antennæ, over 0.5 inch long. *Pupa* white, in cocoon of fiber. *Larva* white, curved, legless. Bores in the stalks and roots. (See text fig. 96.)

Distribution: Hawaii, Jamaica, Barbados, St. Kitts, Antigua, St. Lucia, British Guiana, Fiji, New Guinea, New Ireland, Tahiti, Queensland, Malay Archipelago.

VAN DINE, D. L. U. S. Dept. Agr., Bul. 93, 1911, pp. 35–40. Figs. 4, 5.

Xyleborus perforans Wollaston.

(Sugar-Cane Ambrosia Beetle. Scolytidæ; Coleoptera.)

Hosts: Sugar cane, a polyphagous insect breeding in many kinds of wood.*Injury:* Is very injurious to sugar cane in Java. As it bores in the stalks it can easily be transported in shipments of seed cane.*Description and biology:* *Adult* weevils about 2 mm. long, cylindrical, without snout, the head completely concealed from above. *Pupa* white, about 2 mm. long with head and all appendages on the underside. *Larva* cylindrical, white, legless, with chitinated head. Bores in the pith of the stalk. *Eggs* elliptical. About 70 to 100 eggs are laid by the parent, each at the end of a separate chamber.*Distribution:* Java, cosmopolitan in the tropics and subtropics.

VAN DEVENTER, W. Handboek, voor de Suikerriet-cultuur, Java, 1906, vol. 2, pp. 60-66, pl. 8.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 573-574.

Fig. 97.—Cane-sucker moth (*Castnia licus*). (Ballou.)**Castnia licus** Drury.

(Cane-Sucker Moth: Giant Sugar Cane Borer. Castniidæ; Lepidoptera.)

Hosts: Sugar cane, banana, coconut, orchids, and Bromeliaceæ.*Injury:* Very serious borer in cane stalks. When cane is to be imported from sections where this species occurs great care should be used to eliminate trash. Only the tops should be shipped, and these should be carefully examined for eggs or larvæ at the base of the leaves.*Description and biology:* *Moth* measuring over 3 inches in wing expanse, brown with a white band crossing each wing and a few yellow spots beyond. *Pupa* reddish brown, over an inch in length. *Larva* whitish, about 2 inches long, with reddish brown head. Bores in the stalks of its food plants. *Eggs* laid singly, pinkish, elongate, pointed at each end, ribbed, in cross section formed like a five-pointed star. Over 50 eggs are laid by each moth. (See text fig. 97.)*Distribution:* British Guiana, Dutch Guiana, Trinidad, and other parts of northern South America.

URICH, F. W. The Cane Sucker. 2 pp., with colored plate.

MARLATT, C. L. Bureau of Entomology, U. S. Dept. Agr., Bul. 54, 1905, pp. 71-75, pl. 4.

Sesamia cretica Led.

(Durra Stem Borer. Noctuidæ; Lepidoptera.)

Host: Sugar cane, corn, durra.*Injury:* Very serious pest in Khartoum. Is liable to importation in seed cane.*Description and biology:* *Adult*, a stout bodied, creamy colored moth, with wing expanse of about 30 mm.; hind wings silvery white; forewings creamy with faint brownish markings. *Pupa* 15–18 mm. long, chestnut colored. *Larva* 25–30 mm. long, varying from pinkish or yellowish to dead white; head brown, spiracles black. *Egg* white, 6 mm. in diameter. While this pest is more important as an enemy of durra and maize in Khartoum it is more likely to transportation in sugar cane.*Distribution:* Khartoum, Sudan.

KING, H. H. Third Report Wellcome Research Laboratory Khartoum, 1904, pp 222–224; pl. 27, figs. 1, 3, 6, in color.

Diatræa spp.

(Sugar-Cane Borer Moths. Pyralidæ; Lepidoptera.)

Species: **Diatræa saccharalis* Fabricius; Mexico, West Indies, United States. *D. striatalis* Sn.; West Indies, Java. *D. canella* Hampson; Trinidad, Grenada, Guiana. *D. lineolata* Walker; Trinidad, West Indies, Central America, South America.*Hosts:* Sugar cane and grasses.*Injury:* Very serious injury by boring in the stalk. Easy to transport in seed-cane shipments.*Description and biology:* Gray moths with whitish-spotted larvæ. Pupate in the stalks in the larval tunnels. Eggs are laid in clusters. *Diatræa saccharalis* has been fully treated in American literature. The others behave in a similar manner.

BARBER, T. C. U. S. Dept. Agr., Bur. Ent., 1911, Circ. 139.

STUBBS, W. C., and MORGAN, H. A. Louisiana Exp. Sta., ser. 2, 1902, Bull. 70.

VAN DEVENTER, W. Handboek voor de Suikerrietcultuur, Java, 1906, pp. 131–139, pl. 20.

Chilo simplex Butler.

(Sugar-Cane Moth Borer of India. Pyralidæ; Lepidoptera.)

Hosts: Sugar cane, corn, sorghum, rice, millet.*Injury:* Very serious pest, boring in the stalks. It is liable to importation in seed cane.*Description and biology:* *Moth* yellowish gray, the male a little smaller and darker. *Pupation* occurs in the larval tunnel. *Larva* about an inch long, with a dirty white body and black head, a dark patch behind head and two dark longitudinal lines on body. The small hairs of the body are set on black dots. The larva burrows in the stalks of cane, corn, sorghum, rice, and millet. *Eggs* laid in rows, side by side on the leaves. (See plate XLIV, figs. a, g, m, s.)*Distribution:* India, Formosa.

MAXWELL-LEFROY, H. F. Moth Borer in Sugar Cane. Agr. Journ. India, vol. 1, pp. 97–115.

BASU, S. K., and DUTT, H. L. Crop Pest Handbook for Behar and Orissa. Calcutta Leaflet 56, pl. 38.

Omiodes accepta Butler.

(Hawaiian Sugar-Cane Leafroller. Pyralidæ; Lepidoptera.)

Hosts: Sugar cane, grasses, sedges.*Injury:* Feeds on the leaves, which it rolls for its protection. The damage is sometimes serious. Is liable to importation in seed cane.

Description and biology: *Adult*, brownish with white-lined veins and margins of segments; wings with two darker bands; antennæ long. Wing expanse 20–30 mm. *Pupa* 12–14 mm. long, light brown. *Larva* 27 mm. long, green with a few scattered hairs; head pale yellowish. The larva feeds on the leaf, folding it into a tube to protect itself while feeding, changing to a new leaf when it has eaten all it can. When disturbed it drops to the ground. *Eggs* laid in small clusters arranged in rows on the surface of leaves. (See plate XLV.)

Distribution: Hawaii, Peru.

SWEZEY, OTTO H. Hawaiian Sugar Planters' Assn., Bull. 5, pp. 6–10, pl. 1.

***Polyocha saccharella* Dudgeon.**

(Cane Root Borer. Pyralidæ; Lepidoptera.)

Hosts: Sugar cane.

Injury: Causes stunted growth and shriveling of plants by boring in stalks and roots.

Description and biology: *Moth* small, brown, with hind wings white. *Pupates* in stalk. *Larva* about 0.75 inch in length, of white color; bores in stalk and root; hibernates in root; before pupating it eats an opening in the stem and covers it with silk. (See plate XLIV, figs. d, j, p.)

Distribution: India.

BASU, S. K., and DUTT, H. L. Crop Pest Handbook for Behar and Orissa, Calcutta, Leaflet 58, pl. 38.

***Ereunetis flavistrata* Walsingham.**

(Sugar-Cane Bud Moth. Tineidæ; Lepidoptera.)

Hosts: Sugar cane, palms, banana, pineapple, *Pandanus*.

Injury: While this species mainly lives in the dead tissues of the above food plants, it breeds in cane stalks among the dry leaves, but often eats out the eyes or buds, thus destroying the propagating value of the cane. It may easily be transported in seed cane.

Description and biology: A small *moth*, measuring 14 mm. in wing expanse, head and thorax yellowish white, forewings yellowish white, with indistinct yellow streaks, hind wings shining pale golden yellow, becoming white at apex. *Pupa* 5 to 6 mm. long, pale yellowish brown. *Larva* 12 to 15 mm. long, whitish, head reddish brown, hairs on darker tubercles. The larva usually feeds in the dried leaf sheaths, but sometimes attacks the rind, giving entrance to fungi, and does the greatest damage by eating out the eyes.

Distribution: Hawaii.

SWEZEY, OTTO H. Hawaiian Sugar Planters' Association, bul. 6, pp. 9–12, pl. 2, figs. 1–6.

***Laspeyresia schistaceana* Sn. (Grapholitha).**

(Gray Borer of the Sugar Cane. Tortricidæ; Lepidoptera.)

Hosts: Sugar cane.

Injury: Very important in Java. Is liable to importation in seed cane.

Description and biology: *Moth* about 12 mm. long, grayish brown. *Pupa* reddish brown, 8–13 mm. long. *Larva* yellowish, with head and collar on prothorax as well as two apical segments chitinized reddish brown. Hairs sparse on brownish spots. The larva bores in stalks of the cane. *Eggs* oval; about 120 to 170 are laid in a row under the leaf or behind the sheath of the cane.

Distribution: Java.

VAN DEVENTER, W. Handboek voor de Suikerriet-cultuur, Java, 1906, vol. 2, pp. 142–150, pl. 21, text figs. 46–49.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 284.

B. OTHER IMPORTANT SUGAR-CANE INSECTS.

ORTHOPTERA.

Acrididae and Locustidae.

Oxya intricata Stål of Formosa and Japan; *O. velox* Fabricius of China, Japan, India, and Islands of the Pacific Ocean; *O. annulicornis* Matsumura of Formosa; attack foliage.

Epacromia tamulus Fabricius and *Trilophidia annulata* Thunberg; Java; attack foliage.

Racilia okinawensis Matsumura of Formosa.

Gelastorhinus esox Burr of Japan and Formosa.

Acridium succinctum Linnæus and *A. flavicorne* Fabricius of Japan, China, India, Formosa, and the Malay Archipelago; *A. roseum* De Geer, *A. zehntneri* Krauss, *A. luteicorne* Serville, and *A. æruginosum* Linnæus of Java.

Pachytylus migratorioides Reicharting, an especially serious pest in Formosa, Asia, Africa, and Australia; *Ædaleus infernalis* Saussure of Japan, China, Formosa, India, and Malaysia; *O. nigrofasciatus* Latreille of Asia, Europe, and Africa.



Fig. 98.—Cane grasshopper (*Atractomorpha crenulata*). (Maxwell-Lefroy.)

Atractomorpha crenulata Fabricius (See text, fig. 98) and *A. psittacina* De Haan of Java; *A. bedeli* Bolivar of Japan, China, and Formosa.

Elimæa chloris De Haan, *Mecopoda elongata* Linnæus; Java.

Tryxalis nasuta Linnæus of Formosa, Asia, Africa, and Europe; *Phlæoba infumata* Brun, of Formosa, China, and Malaysia; *Stenobothrus formosanus* Matsumura of Formosa; *Trilophidia annulata* Thunberg and *Epacromia tamulus* Fabricius of Asia and the islands of the Pacific; *Paratettix gracilis* Shiraki, *P. singularis* Shiraki, *Hedotettix arcuatus* Shiraki, and *Tettix formosanus* Shiraki of Formosa.

Gryllidae, Gryllotalpidae.

Liogryllus bimaculatus De Geer, *L. formosanus* Matsumura, *Gryllus mitratus* Burmeister, *Tridactylus flavomaculatus* Matsumura, *Gryllotalpa africana* Pallas; *Æcanthus indicus* Saussure, *Anaxiphus pallidulus* Matsumura, and *Trigonidium haani* Saussure; Oriental Regions.

HEMIPTERA.

Coccidæ.

Armored—

- Aspidiotus (Odonaspsis) secreta saccharicaulis* Zehntner; Java.
Aspidiotus (Targionia) glomerata Green; India.
Aspidiotus (Targionia) sacchari Cockerell; West Indies, Java, British Guiana.
Chionaspis depressa Zehntner; Java, India.
Chionaspis madiunensis Zehntner; Java.
Chionaspis saccharifolii Zehntner; Java.
Chionaspis tegalensis Zehntner; Java, Mauritius.

Unarmored—

- Aclerda japonica* Newstead; India.
Asterolecanium bambusæ Boisduval; Madeira.
Icerya seychellarum Westwood; Seychelles, Madeira, Formosa.
Lecanium guerinii Signoret; Mauritius.
Lecanium krugeri Zehntner; Java.
Margarodes formicarum Guild; Barbados.
Pseudococcus boninsis Kuwana; Japan.
 * *Pseudococcus bromeliæ* Bouché; Hawaii.
Pseudococcus calceolaria Maskell; Hawaii, St. Croix, Porto Rico, Barbados. (See pl. XLVI.)
Pseudococcus sacchari Cockerell; Costa Rica, Hawaii, Porto Rico, Barbados, Cuba.
Pseudococcus saccharifolii Green; Hawaii.
 * *Pseudococcus texensis* Tinsley; Texas, Mauritius.
Pulvinaria iceryi Guérin; Mauritius, Formosa.
Ripersia sacchari Guénée; India.

Fig. 99.—Cane leafhopper (*Pyrrilla aberrans*).

Jassoidea, Fulgoroidea.

Dictyophora sinica Walker, *Anagnia splendens* Germar, *Ricania tæniata* Stål., *Diastrombus politus* Uhler, *Phenice moesta* Westwood, *Nicertoides saccharivora* Matsumura, *Nisia atrovirens* Lethierry, *Oliarus oryza* Matsumura, *Delphacodes vastatrix* Breddin, which is very injurious in Java; *Kirbya pagana* Melichar, *Tropidocephala brunneipennis* Signoret, *T. saccharivorella* Matsumura, *T. formosana* Matsumura, *Stenocranus sacchari* Matsumura, *Delphax propinqua* Fieber, *D. furcifera* Horvath, *D. graminicola* Matsumura, *D. fumosa* Matsumura, *Zygina circumscripta* Matsumura, *Z. maculifrons* Motschulsky, *Z. subrufa* Melichar, *Gnathodus viridis* Matsumura, *G. pallidulus* Matsumura, *Cicadula fasciifrons*, *C. 6-notata* Fallen, *Nirvana pallida* Melichar, *N. suturalis* Melichar, *Deltocephalus dorsalis* Motschulsky, *Nephotettix apicalis* Motschulsky, *Eucanthus semiglaucus* Lethierry, *Tetigonia viridis* Linnæus, *T. albida* Walker, *T. ferruginea* Fabricius, *Strongylocephalus agrestis* Fallen, and *Ptyelus costalis* Walker; Formosa and oriental regions; *Pyrrilla aberrans* Distant, India. (See text, fig. 99.) *Phenice maculosa* Westwood, *Dicranotropis vastatrix* Breddin, and *Eumetopina krugeri* Breddin; Java.

The leafhoppers of the genus *Perkinsiella* seem to be partial to sugar cane, sometimes attacking grasses. Aside from *P. saccharicida* Kirkaldy, treated above, the following species are recorded by Muir: *P. vitiensis* Kirkaldy, Fiji; *P. graminicola* Kirkaldy, Hawaii; *P. sinensis* Kirkaldy, Borneo; *P. pallidula* Muir, Borneo; *P. rattlei* Muir, British New Guinea; *P. bicoloris* Muir, British New Guinea; *P. variegata* Muir, British New Guinea; *P. papuensis* Muir, British New Guinea; *P. vastatrix* Breddin, Java, Borneo, British New Guinea; *P. lalokensis*, Muir, British New Guinea; *P. amboinensis* Muir, Amboina. Owing to the habit of laying eggs in the cane stalks any of these species can be transported in cane shipments.

Cicadidæ.

Mogannia hebes Walker; Java.

Aleyrodidæ.

Neomaskellia bergii Signoret; Formosa, oriental regions.

Aleurolobus longicornis Zehntner, and *Aleyrodes lactea* Zehntner; Java.

Aphididæ.

Oregma lanigera Zehntner; Formosa; very injurious.

Geoica lucifuga Zehntner; Formosa.

Miridæ (Capsidæ).

Lygus oryzæ Matsumura and *L. sacchari* Matsumura; Formosa.

Periscopus mundulus Breddin; Java.

Tingitidæ.

Serenthia formosana Matsumura; Formosa.

Leptodictya tabida H. Schaeffer; Mexico.

Lygæidæ.

Cymnus tabaci Matsumura; Formosa.

Colabathristes saccharicida Karsch; Java.

Coreidæ.

Cletus trigonus Thunberg, *C. bipunctatus* H. S., *Riptortus fuscus* Fabricius, and *Leptocorisa varicornis* Fabricius; Formosa.

Pentatomidæ.

Scotinophora tarsalis Voll., *Menida histrio* Fabricius, *Nezara viridula* Linnæus, and *Coptosoma cribraria* Fabricius; Formosa.

THYSANOPTERA.

Heliothrips striatoptera Kobus, *Physopus sernotatus* Zehntner, *Oxythrips binervis* Kobus, *Parthenothrips* (?) *kobusi* Van Deventer, *Stenothrips* (?) *zehntneri* Van Deventer, *Thrips sacchari* Krüger, *T. serrata* Kobus, *T. minuta* Van Deventer, and *Phlæothrips lucasseni* Krüger; Java.

Phlæothrips pallidicornis Matsumura; Formosa.

COLEOPTERA.

Bostrychidæ.

Dinoderus minutus Fabricius; India. (See Bamboo.)

Scarabæidæ.

Oryctes rhinocerus Linnæus (see Palms), *Xylotrupes dichotomus* Linnæus, and *Ligyrrus rugiceps* Le Conte; the destructive scarabæids, whose larvæ feed at the cane roots; oriental regions.

Xylotrupes gideon Linnæus, *Anomala ænea* Perty, *Adoretus umbrosus* Fabricius (see Rose), and *Holotrichia leucophthalma* Wiedemann; the very destructive scarabæids, whose larvæ feed at the roots of cane; Java; oriental regions.

Holotrichia vidua; attacks cane in the Philippines.

Tenebrionidæ.

Gonocephalum (Opatrum) acutangulum Fairmaire, which bores in sugar cane and tobacco stalks.

Elateridæ.

Agriotes formosanus, *A. taichuensis*, *A. sacchari*, *Æolus vittatus*, *Cardiophorus devastans*, *C. formosanus*, *Ludius suturalis*, and *Lacon shirakii*, all described by Matsumura; Formosa and oriental regions.

Chrysomelidæ.

Monolepta nigrobilineata Motschulsky; *Colaspidea metallica* Rossi, a very injurious species; *Nodostoma lateralis* Matsumura and *Hispa callicantha* Baly; Formosa and oriental regions.

Brachyrhinidæ.

Echinocnemus squameus Billberg, *Myloccerus brunneus* Matsumura, *M. guttulus* Matsumura, *Episomus albinus* Matsumura, *Cneorhinus albiguttatus* Matsumura, *Phytoscaphus formosanus* Matsumura, *Tanymecus rusticus* Fabricius (a very injurious species); Formosa.

Hypomeces unicolor Fabricius, which breeds at the roots of young cane and also attacks rice; Java.

Curculionidæ.

Lixus vetula Fabricius; Formosa.

Baris saccharivora Matsumura; Formosa.

Calandridæ.

Rhynchophorus palmarum Linnæus; Trinidad. (See Coconut palm.)

Cosmopolites sordidus Germar; Pacific Islands. (See Banana.)

LEPIDOPTERA.

Rhopalocera.

Cyllo leda Linnæus, *Discophora celinde* Stoll, *Pamphila dara* Kollar, *Hesperia philino* Möschler, *H. conjuncta* H. S.; Java.

Parnara mathias Fabricius and *Telicota augias* Linnæus; *Mycalesis mineus* Linnæus and *Melanitis leda* Linnæus; Formosa and oriental regions.

Sphingidæ.

Leucophlebia lineata Westwood; Formosa, Java.

Notodontidæ.

Anticyra combusta Moore (*Phalera*); Java.

Cnethocampidæ.

Dreata petola Moore; Java.

Arctiidæ.

Phissama interrupta Linnæus; Java.

Lymantriidæ.

Psalis securis Hübner, *Euproctis minor* Snellenhoeven, *Lælia subrufa* Snellenhoeven, *Procodeca adara* Moore, and *Aroa socrus* Hübner; Java.

Laelia costalis Matsumura; Formosa.

Euproctis flavata Cramer; oriental regions.

Noctuidæ.

Sesamia nonagrioides Lef., *Spodoptera pecten* Guénée, *Agrotis interjectionis* Guénée, *Remigia frugalis* Fabricius (see text fig. 100); Java.

Nonagria exitiosa Oliff is destructive to cane in New South Wales.

Nonagria inferens Walker, which is very injurious to cane in Formosa; *Cirphis unipuncta* Haworth, a cosmopolitan pest; and *L. loreyi* Dup; Formosa. *Nonagria uniformis*; India. (See pl. XLIV, figs. c, f, i, o.)



Fig. 100.—Cane moth (*Remigia frugalis*) (Maxwell-Lefroy).

Pyalidæ.

Botys colesalis Walker, *Cnaphalocrocis bifurcalis* Snellenhoeven, *Scirpophaga intacta* Snellenhoeven, and *Chactosticha nana* Zehntner; Java.

Chilo infuscatella Snellenhoeven, *Scirpophaga auriflua* Zeller, a serious borer (see pl. XLIV, figs. b, h, l, n, r), and *Diatræa striatalis* Snellenhoeven; Formosa and oriental regions.

Anerastia ablutella Zeller; India; borer. (See pl. XLIV, figs. e, k.)

Chilo auricilia Dudgeon; India. (See Rice.)

Scirpophaga chrysorrhæa Zeller and *S. monostigma* Zeller (see pl. XLIV, fig. g); India; very injurious borers.

Elachistidæ.

Cosmopteryx pallifasciella Snellenhoeven; Java.

Autosticha pelodes Meyrick breeds in dead cane leaves and other plants in Hawaii.

Tortricidæ.

Eucosoma schistacea Snellenhoeven; causes much injury by boring in the stems; Formosa.

Phycitidæ.

Cryptoblabes aliena Swezey attacks green cane leaves, corn, and sorghum, as well as other plants.

Tineidæ.

Ereunetis pilosata Swezey and *E. muiriella* Swezey of British New Guinea attack the cane exactly as *E. flavistriata*; *Opogonia aurisquamosa* Butler of Hawaii, Marquesas, and Society Islands; *O. apicalis* Swezey of Hawaii; *O. dimidiatella* Zeller of Java; *O. saccharella* Swezey, and *O. fumiceps* Felder of British New Guinea attack the wet dead leaves and lower buds of cane.

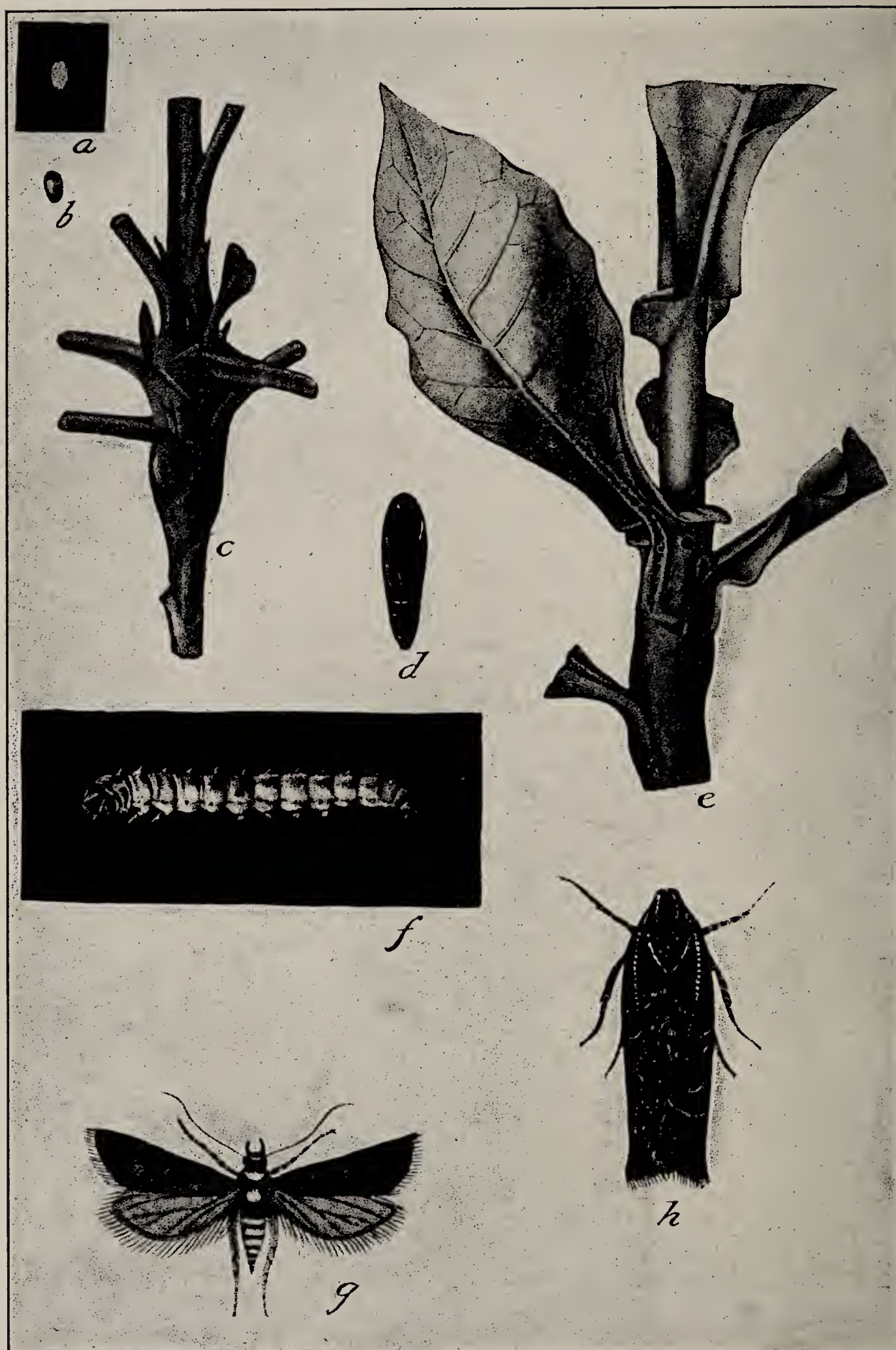
LITERATURE.

- MATSUMURA, S. Die Schädlichen und Nützlichen Insekten vom Zuckerrohr Formosas, The Keiseisha, Tokyo, 1910. Also in Zeit. f. wiss. Ins. biol., band. 6, pp. 101-104; 136-139.
 VAN DEVENTER, W. Handboek voor de Suikerriet-cultuur, Java, vol. 2, 1906.
 MUIR, F. Hawaiian Sugar Planters' Assn., Entom. bul. 9, 1910, 11 pp., 5 figs.
 HEIDEMANN, O. Journ. Econ. Entom. 1913, vol. 6, pp. 249-251, fig. 1.
 SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.
 SWEZEY, E. P. Hawaiian Sugar Planters' Assn. Bul. 6, 1909.



THE SUGAR-CANE MEALY-BUG.

The sugar-cane mealy-bug* (*Pseudococcus calceolariae*): FIG. 1.—Adult mealy-bugs clustered about base of young cane. FIG. 2.—Adult females, enlarged. FIG. 3.—Single adult with mealylike covering. FIG. 4.—Cocoons. (Van Dine.)



THE TOBACCO STEM-BORER.

E The tobacco stem-borer (*Gnorimoschema heliopa*): FIGS. *a, b*.—Eggs. FIGS. *c, e*.—Injury. FIG. *d*.—Pupa. FIG. *f*.—Larva. FIGS. *g, h*.—Adults. (Maxwell-Lefroy.)

SWEET POTATO.

(*Ipomoea batatas* Poir. Family Convolvulaceæ.)

The sweet potato is now grown in many parts of the world, and, while not often shipped into the United States because of our own bountiful crops, there is always likelihood of danger in shipment of tubers for propagation purposes. The only enemies of the vine which are dangerous are those which attack the tubers.

A. BETTER KNOWN SWEET-POTATO INSECTS LIKELY TO BE IMPORTED.

Cylas brunneus Fabricius.

(Liberian Sweet-Potato Borer. Curculionoidea: Coleoptera.)

Host: Sweet potato.

Injury: Attacks tubers in a manner similar to *C. formicarius*. Liable to introduction in the tubers.

Description: A wingless elongate weevil with body constricted in front of elytra; unicolorous, brown, bronzy or black, of the same form as *C. formicarius*.

Distribution: Liberia.

* ***Cylas formicarius*** Fabricius.

(Sweet-Potato Weevil. Curculionoidea: Coleoptera.)

Host: Sweet potato.

Injury: Very serious pest of sweet-potato tubers.

Description and biology: *Adult* an elongate weevil, with steel-blue elytra, reddish prothorax and legs and darker head; about 0.33 inch in length. *Pupa* white, elongate with all appendages folded underneath. *Larva* a white footless grub with dark-brown head; bores in the tubers of the sweet potatoes and pupates in its burrows. It attacks the tubers both in the field and in storage.

Distribution: Nearly cosmopolitan; Florida to Texas, but not present in all sweet-potato sections of the United States.

BASU, S. K., and DUTT, H. L. Crop Pest Handbook for Behar and Orissa, 1913, Calcutta, Leaflet 71, pl. 47.

Euscepes batatae Waterhouse. (***Cryptorhynchus***.)

(West Indian Sweet-Potato Weevil. Curculionidæ; Coleoptera.)

Host: Sweet potato.

Injury: Bores in the tuber. Very easily distributed. This weevil is caught in quarantine in almost every shipment of sweet potatoes from Hawaii to California but has not yet become established.

Description and biology: *Weevil* elliptical, brown, covered with flat scales and bristling with stiff erect scales; beak short, concealed on breast when at rest. *Pupa* white, oval with two apical spines. *Larva* curved, white, legless with chitinous head.

Distribution: West Indies (Barbados, Antigua), Hawaii.

FULLAWAY, D. T. Hawaii Agr. Exp. Sta., 1911, Bul. 22, pp. 27-29, fig. 9.

WHITNEY, L. A. Monthly Bulletin California St. Comm. Horticulture, 1915, vol. 4, pp. 162-164, figs. 24-28.

Omphisa anastomosalis Guénée.

(Sweet-Potato Stem Borer. Pyralidæ; Lepidoptera.)

Host: Sweet potato, other garden crops.

Injury: Bores in the stem and sometimes into the tuber, in which case it can easily be disseminated.

Description and biology: *Moth* white, with the body suffused with ochereous and rufous, leaving some pale spots on the dorsum; forewings with rufous suffusion on basal area extending below median nervure to middle of wing, hyaline patches at middle and end of cell, rufous edged ochereous spot between them, and another beyond cell, curved postmedial rufous line with irregularly dentate line beyond it inclosing series of hyaline patches; hind wings with base rufous, two irregularly waved rufous post-medial lines; expanse 32–36 mm. *Larva* 30 mm. long, pale yellowish white, with conspicuous brown tubercles. *Eggs* elliptical, flat or moderately rounded, laid on leaves.

Distribution: China, India, Ceylon, Java. Introduced into Hawaii about 1900 and has become quite a pest.

FULLAWAY, D. T. Hawaii Agr. Exp. Sta., 1911, Bul. 22, pp. 16–19, fig. 6.

B. IMPORTANT SWEET-POTATO INSECTS.

HEMIPTERA.

Jassidæ and Fulgoridæ.

Nesosydne ipomæicola and *Aloha ipomææ*; Hawaii.

COLEOPTERA.

Conchyloctenia punctata Fabricius; Africa; sometimes serious.

Scarabæidæ.

Adoretus umbrosus tenuimaculatus Waterhouse; Hawaii, Japan.

Chrysomelidæ.

Aspidomorpha militaris Fabricius; India, Java; leaf beetle.

LEPIDOPTERA.

Noctuidæ.

Agrotis crinigera, *A. dislocata*, *A. saucia* Hübner, *Spodoptera mauritia* Boisduval, *Laphygma exigua* Hübner, *L. reclusa* and *Plusia chalcites* Esp.; Hawaii; cutworms.

Sphingidæ.

Herse convolvuli Linnæus; Hawaii, United States.

Tineidæ.

**Bedellia minor* Busck; Hawaii, Florida; leaf miner.

Bedellia somnulentella Zeller; Cosmopolitan.

Bedellia orchilella Walsingham, Hawaii; an important leaf miner.

Pyalidæ.

Phlyctænia despecta Butler; Hawaii; leaf roller.

Tortricidæ.

Amorbia emigratella Busck; South America, Hawaii; leaf roller.

TAMARACK.

See Conifers.

TAMARIND.

(*Tamarindus indicus* L. Family Leguminosæ.)

An ornamental shade tree grown everywhere in the Tropics. It is grown in southern Florida and California and is used in conservatories in more northern countries. The pods contain a pleasant pulp used in the Tropics as a basis for a cooling drink. This pulp is also used in medicine. The wood is valuable for furniture.

IMPORTANT TAMARIND INSECTS:

COLEOPTERA.

Mylabridæ.

Caryoborus gonagra Fabricius; India, breeds in seed.

Calendridæ.

Calendra linearis Herbst; Brazil, West Indies.

**Calendra rugicollis* Casey, Key West, Fla.; breeds in seed in pod.

Tenebrionidæ.

**Palembus ocularis* Casey; Key West, Fla.

STEBBING, E. P. Indian Forest Insects. Coleoptera, 1914.

TAMARISK.(*Tamarix* spp. Family Tamariscaceæ.)

Ornamental trees or shrubs occurring from Mediterranean regions to East Indies and Japan. *Tamarix gallica* is planted in many places on our Gulf coast. Several species have medicinal properties and yield dyestuffs. The punctures of *Coccus manniparus* cause *Tamarix mannifera* to produce "manna."

IMPORTANT TAMARISK INSECTS.**COLEOPTERA.****Curculionidæ.**

Coniatus lætus Miller, and *C. suavis* Gyllenhal, Europe; breed on the leaves.

Nanophyes tamaricis Gyllenhal; Europe; breeds in the ovaries of *Tamarix gallica*.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-87.

TEA.(*Thea sinensis*. Family Ternstroemiaceæ.)

The tea plant is a flowering shrub much valued for its leaves, which yield the universally used beverage. It occurs in China and India and is also propagated in this country. Other species of the genus are much prized as flowering shrubs.

A. BETTER KNOWN TEA INSECTS LIKELY TO BE IMPORTED.

Xyleborus fornicatus Eichhoff.

(Shot-hole borer of tea. Ipidæ; Coleoptera.)

Host: Tea, coffee, cacao.

Injury: Tunnels in pith of young twigs and in wood of old trunks. Very injurious.

Description and biology.—*Beetle* oblong, shining, fuscous, 1-4 mm. long; *larva* develops into beetles in fallen twigs.

Distribution: Ceylon, Java, India.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 575.

Biston suppressarius Gn.

(Indian Tea Geometrid. Geometridæ; Lepidoptera.)

Hosts: Tea, *Dodonea viscosa*, *Carissa diffusa*, *Bauhinia variegata*, *Acacia catechu*, *Acacia modesta*, *Rothra tinctoria*, *Cassia auriculata*, *Albizzia*.

Injury: Serious as defoliator of tea and forest trees.

Description and biology: *Moth*, gray with black markings. *Larva* green. Has three broods a year.

Distribution: India.

STEBBING, E. P. Manual Forest Zoology, India, 1908, p. 133, fig. 267.

Psyche spp., etc.

(Tea Bagworms. Psychidæ; Lepidoptera.)

Species: *Psyche albipes* Moore; Ceylon; tea. *Psyche assamica* Watt; India; tea. *Acanthopsyche reidi* Watt; India; tea. *Acanthopsyche snelleni* Heyl; India; tea. *Amatissa consorta* Templeton; India, Ceylon; tea. *Clania variegata* Snell.; India, Ceylon, Java; tea, cinchona, coffee. *Clania crameri* Westwood; India; tea, cinchona, coffee, *Pinus longifolia*. *Clania holmesi* Wall; India; tea.

Injury: Feed on foliage, twigs, and bark.

Biology: The larvæ feed in bags made from scraps of bark, etc.

WATT and MANN. Pests and Blights of the Tea Plant, Calcutta, 2d ed., 1903, pp. 188-200, figs. 13-15, portions of pls. 7, 8.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 328, 329.

B. OTHER IMPORTANT TEA INSECTS.

ACARINA.

Tetranychidæ.

Tetranychus bioculatus Wood-Mason. (See Coffee.)

HEMIPTERA.

Coccidæ.

- **Fiorinia theæ* Green; cosmopolitan; tea, olive, etc. (See pl. V, fig. 1.)
- **Orthezia insignis* Douglas; cosmopolitan; tea, citrus (See pl. IV, fig. 2.)
- **Coccus hesperidum* Linnæus; cosmopolitan; tea, citrus, palms. (See pl. II, fig. 2.)
- Pulvinaria theæ* Froggat; Australia; *Thea viridis*.
- Coccus viridis* Green; Ceylon, Hawaii.

LEPIDOPTERA.

Cossidæ.

Zeuzera coffeæ Nietner; borer. (See Coffee.)

Cochliidiidæ.

Belippe albiguttata Linnæus, serious injury in Java.

Zygænidæ.

Heterusia cingala Moore; serious in Ceylon, India.

Geometridæ.

Ophthalmodes cretacea Butler; Japan.

Lymantriidæ.

Euproctis divisa Walker and *E. latifascia* Walker; Orient. *Dasychira mendosa* Hübner, *D. misana* Moore, *D. thwaitesi* Moore; India, Ceylon, Java. *Orgyia postica* Walker; Java, Ceylon. *Andraca bipunctata* Walker; India.

Notodontidæ.

Stauropus alternus Walker; India, Ceylon, Java.

TEAK.

(*Tectona grandis*. Family Verbenaceæ.)

A valuable timber tree of the Orient.

IMPORTANT TEAK INSECTS.

COLEOPTERA.

Cucujidæ.

Silvanus advena Walth.; India; breeds in leaves, forming galls, causing leaves to drop.

Malacodermidæ.

Plateros dispallens Walker; India; oviposits in clusters on twigs; defoliates trees.

Buprestidæ.

Psiloptera fastuosa Fabricius; India; bores in wood.

Elateridæ.

Adelocera modesta Boisduval; India; bores in bast and sapwood.

Chrysomelidæ.

Aspidomorpha sanctæcrucis Fabricius; India; a tortoise-shell beetle; defoliates.

Cerambycidæ.

Stromatium barbatum Fabricius; India; bores in wood of saplings. *Stromatium longicorne* Newman; India; a very serious borer. *Gelonætha hirta* Fairmaire and *Xylotrechus smeii* Lap. et Gory; India; bore in bast and sapwood.

Brachyrhinidæ.

Astycus lateralis Fabricius; India. *Mylocerus viridanus* Fabricius; India; a serious defoliator. *Mylocerus carinirostris* Marshall and *M. discolor variegatus* Boheman; India. *Cyrtepestomus pannosus* Marshall; India; a defoliator as an adult.

LEPIDOPTERA.

Cossidæ.

Cossus cadambe; India; bores in wood of lopped trees. *Duomitus ceramicus*; India; bores in wood and is very destructive.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

STEBBING, E. P. A Manual of Forest Zoology for India, 1908.

TIMBER.* *Nacerdes melanura* Linnaeus.(Timber Beetle. *Ædemeridæ*; *Coleoptera*.)

Host: Bores in wharf timber, creosoted and untreated piling, paving blocks, and pine flooring.

Injury: Reported as doing considerable damage at Auckland, New Zealand.

Description: *Beetle* 12 mm. long, elongate, subdepressed, brownish yellow or reddish, with yellowish pubescence; dilated sides of thorax, femora, tibiae, and tips of elytra blue or blackish. *Pupa* 16 mm. long, creamy colored, with two median and two lateral protuberances on apical segment. *Larva* 24 mm. long, cylindrical, tapering toward apex; creamy colored, front of head light brown; mandibles black; legs short; third and fourth abdominal segments swollen beneath and with two protuberances

each; ninth abdominal segment somewhat bent, with transverse fissure at apex.

Distribution: Europe, introduced into New Zealand, Eastern United States.

BROWN, T. Tenth Rept. New Zealand Dept. Agric., 1902, pp. 460-463, figs. 1-7.

TIMOTHY.

(*Phleum pratense* Linnaeus. Family *Gramineæ*.)

This grass is a native of Europe now

extensively cultivated in America for hay. A discussion of its insect pests will be found under Grains and Grasses.

TOBACCO.

(*Nicotiana tabacum* Linnaeus. Family *Solanaceæ*.)

Tobacco is grown in many parts of the world and is a very important article of commerce in various forms. Commercial importations generally consist of manufactured products, loose leaf, stem, and seed. The greatest dangers lie in the manufactured products and loose-leaf tobacco. There are at present no quarantine restrictions on tobacco. The tobacco plant has many very important enemies in foreign countries, which are not extremely likely to enter the country in connection with tobacco shipments, but which should be guarded against. Many of these important insects are listed to assist in the work of identification.

A. BETTER KNOWN TOBACCO INSECTS LIKELY TO BE IMPORTED.

Aleyrodes spp.

(Tobacco White Flies. *Aleyrodidæ*; *Hemiptera*.)

Species: *A. tabaci* Gennadios; Greece; tobacco. (See text fig. 101.) * *Trialeurodes vaporariorum* Westwood, cosmopolitan; many hosts.

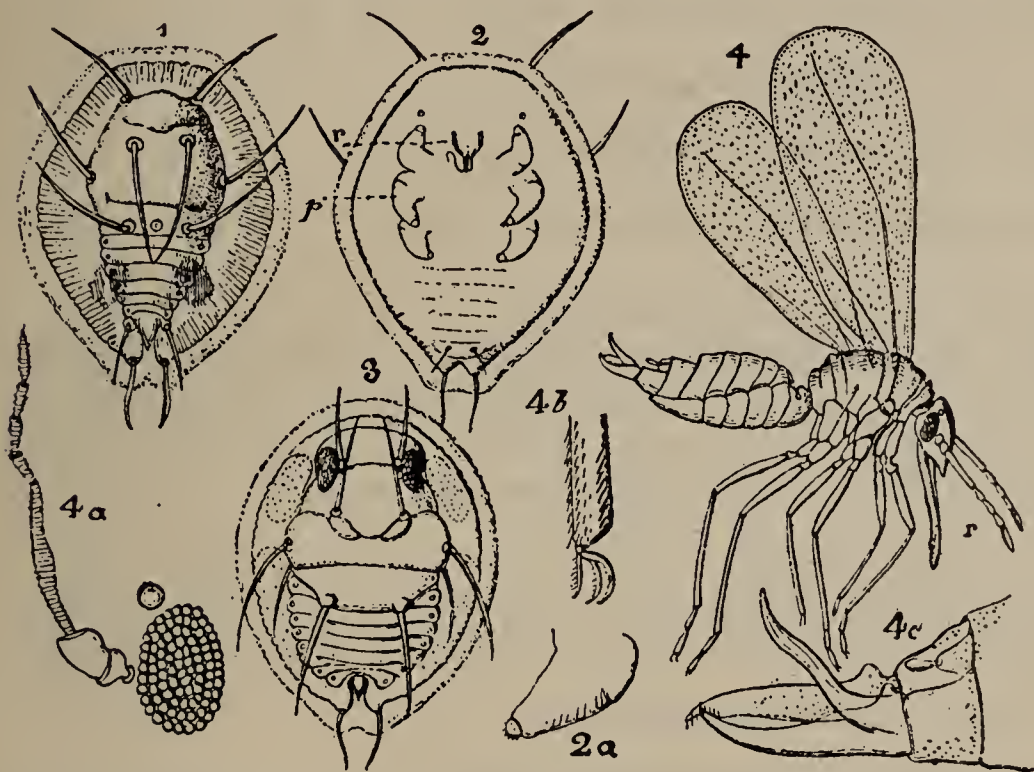


Fig. 101.—Tobacco white fly (*Aleyrodes tabaci*): 1, pupa case, dorsal view; 2, pupa case, ventral view; 2a, larval leg; 3, more mature pupa case, dorsal view; 4, adult male; 4a, male antenna and eye; 4b, tip of tarsus; 4c, tip of male abdomen. (Targioni-Tozzetti.)

Injury: Suck juices from foliage; injure value of tobacco leaf.

Description: *Adults* tiny white flies.

KIRKALDY, G. W. Hawaii Bd. Comm. Agr. and Forestry, Bull. 2.

TARGIONI-TOZZETTI, AD. *Animali ed Insetti del Tabacco*, 1891, pp. 246–249, fig. 86.

Catorama tabaci Guérin-Meneville.

(Tobacco Beetles. Anobiidæ; Coleoptera.)

Hosts: Stored products.

Injury: Attacks dried tobacco.

Description and biology: *Adult* beetle ovate-discoidal, convex, brown, covered with whitish pubescence, about 5 mm. long. *Larva* similar to that of *Lasioderma*.

Distribution: Europe.

TARGIONI-TOZZETTI, AD. *Animali ed Insetti del Tabacco*, 1891, pp. 92, 93.

Agriotes lineatus Linnæus.

(Tobacco Wireworm. Elateridæ; Coleoptera.)

Hosts: Tobacco, grain, potatoes, beets, peas, clover, cabbage, hops, corn, carrots, lettuce, peach, etc.

Injury: Larvæ tunnel the roots and sometimes stems.

Description and biology: *Adult* a snapping beetle 7–8 mm. long, brown with griseous pubescence; second and fourth elytral intervals blackish; antennæ, anterior margin, and posterior angles of prothorax reddish brown. *Larvæ* elongate, chitinous wireworms; feed in the roots and stems of plants and cause much damage.

Distribution: Europe, Asia, Africa.

TARGIONI-TOZZETTI, AD. *Animali ed Insetti del Tabacco*, 1891, p. 81, figs. 30, 31.

SORAUER, P. *Handbuch der Pflanzenkrankheiten*, 3d ed., 1913, vol. 3, p. 482, fig. 295c.

Agriotes pilosus Lacordaire.

(Tobacco Wireworm. Elateridæ; Coleoptera.)

Host: Tobacco.

Injury: Larvæ tunnel the plants.

Description and biology: *Adult* a snapping beetle, black, 12–14 mm. long. *Larva* 25 mm. long, chitinous, wireworm, feeds in the roots and stems.

Distribution: Bessarabia, Portugal.

LINDEMAN, K. VON. *Die Schädlichsten Insekten des Tabak in Bessarabia*, 1888, Moscou.

TARGIONI-TOZZETTI, AD. *Animali ed Insetti del Tabacco*, 1891, p. 82.

Athous niger Linnæus.

(Tobacco Wireworm. Elateridæ; Coleoptera.)

Hosts: Tobacco, beets.

Injury: Larvæ tunnel the plants.

Description and biology: *Adult*, snapping beetle, shining black with cinereous pubescence; length 11–12 mm. *Larva* 18–20 mm. long; a wireworm which feeds in the roots of tobacco and other plants.

Distribution: Europe.

LINDEMAN, K. VON. *Die Schädlichsten Insekten des Tabak in Bessarabia*, 1888, Moscou.

TARGIONI-TOZZETTI, AD. *Animali ed Insetti del Tabacco*, p. 79.

Gnorimoschema heliopa Low.

(Tobacco Stem Borer. Gelechiidæ; Lepidoptera.)

Host: Tobacco.*Injury:* Very injurious as a stem borer. Stems having swellings should be destroyed.*Description and biology:* *Adult* moth small and brown with narrow fringed wings. *Pupa* stage is spent in stem. *Larva*, caterpillar bores into the leaf stem and bores downward in the stalk, causing a swelling to appear in two or three weeks. In cold weather this stage lasts 6 to 10 weeks. *Eggs* deposited singly upon leaves, stems, and stalks, usually upon the lower side of leaves or stems. In cold weather this stage lasts 2 or 3 weeks. Warm weather reduces the development from about a third to a half. (See plate XLVII.)*Distribution:* Australia, Ceylon, India.

MAXWELL-LEFROY, H. F. Indian Insect Pests, 1906, Calcutta.

BASU, S. K., and DUTT, H. L. Crop Pest Handbook for Behar and Orissa, 1913. Dept. Agr. Behar and Orissa, Calcutta. Leaflet 53, Pl. 36.

***Phytomyza affinis** Fallen (**nigricornis** Macquart).

(Marguerite fly. Agromyzidæ; Diptera.)

Hosts: Tobacco, *Cineraria*, *Cosmos*, *Helianthus*, *Geranium*, *Dahlia*, *Chrysanthemum*, marigold, nasturtium, lettuce, celery, carrot, parsnip, pea, cape weed, dandelion, etc.*Injury:* Mines the leaves, destroying their value for high-grade products. Might be distributed in celery or tobacco.*Description and biology:* *Adult* fly very tiny. *Pupa* is formed in leaf mine. *Larva* tunnels the leaf. *Egg* laid on under surface.*Distribution:* Tasmania, New Zealand, Australia, Europe, United States.

LEA, A. M. Insect and Fungous Pests of the Orchard and Farm, Hobart, Tasmania, pp. 81-84.

B. OTHER IMPORTANT TOBACCO INSECTS.

ORTHOPTERA.

Gryllidæ and Locustidæ.*Acridium migratorium* Fieber, and *Anisolabris maritima* Fieber; Europe.*Atractomorpha crenulata* Fabricius; India.*Brachytrypes achatinus* Stoll; Asia.*Caloptenus italicus* Burmeister; Mediterranean Regions.*Chrotogonus trachypterus* Blanchard; India.*Locusta viridissima* Fabricius; Europe, Asia, Africa.*Pachytus sulcicollis*; Transvaal.**Gryllotalpidæ.***Gryllotalpa gryllotalpa* L. (*vulgaris* Latreille); Europe.*Gryllotalpa africana* Pal. B.: widely distributed.*Schizodactylus monstrosus* Drury; Asia.

HEMIPTERA.

Miridæ (Capsidæ).*Gallobellicus crassicornis* Distant; India.**Lygæidæ.***Cymnus tabaci* Matsumura; Formosa.*Nysius minor* Distant; India.**Pentatomidæ.***Nezara viridula* Linnaeus; Transvaal.

COLEOPTERA.

Scarabæidæ.*Adoretus umbrosus* Fabricius; Hawaii; feeds on leaves.*Melolontha vulgaris* Fabricius of Europe; *M. rufipes* Herbst of Europe, Asia, Africa; *M. tenebrosus* Kiesenwetter, *M. niger* Fabricius; and *M. castanipes* Paykull; breed at roots of tobacco.

Scarabæidæ—Continued.

Cetonia lugubris Voet; Europe; breeds in tender bark above the ground, causing reddening of plant.

(See text fig. 102.)

Pentodon punctatus Kirby; Europe; Africa; larva destructive to roots.

Oxythyrea funesta Poda; Italy; damages leaves.

Tenebrionidæ.

Blaps mucronata Latreille; Italy.

Entochira lateralis Boheman; Java. (See Sugar cane.)

Gonocephalum intermedium Fischer; Bessarabia; causes stunted growth by boring.

Gonocephalum acutangulum Fairmaire; Java; bores in stalks: *G. (Opatrum) pusillum* Fabricius; Europe; borer.

Pedinus femoralis Mulsant; Bessarabia.

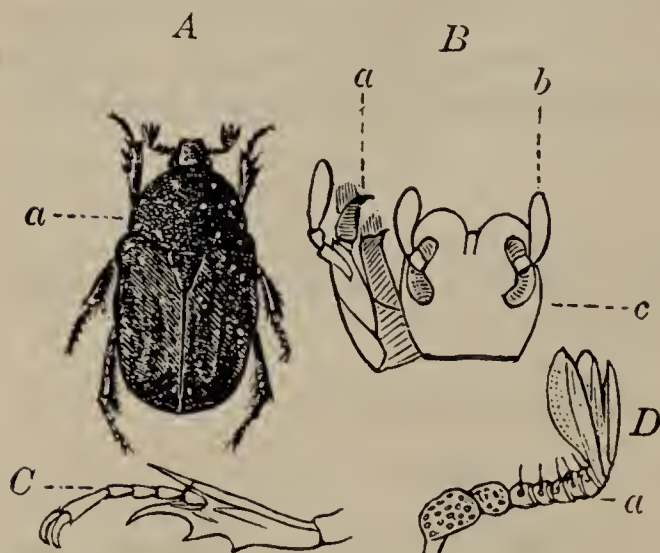


Fig. 102.—Tobacco beetle (*Cetonia lugubris*). (Targioni-Tozzetti.)

Micromima olivia; Cuba, leaf roller on tomato, tobacco, and eggplant.

Plusia gamma Linnæus; Europe, and *P. argentifera*; Tasmania.

Prodenia litura Fabricius; Asia, Africa, Australia. (See text fig. 105.)

Spodoptera mauritia Boisduval, and *Triphæna pronuba* Linnæus; very widely distributed. (See text fig. 106.)

Gelechiidæ.

**Phthorimæa operculella* Zeller. (See Potato.)

Curculionidæ.

Cleonus punctiventris Germar; Europe. (See Beet.)

LEPIDOPTERA.**Noctuidæ.**

Agrotis trux Hübner of Europe, *A. segetum* Schiffmiller (see text fig. 103) of Europe, *A. msacta lactinea* Cr. of Asia (see text fig. 104), *A. moorei* of Asia, *A. lineola* Fabricius of India and Ceylon; cutworms.

Laphygma reclusa; Orient.

Chloridea peltigera Schiffmiller, and *C. assulta* Guénée; India.

Euxoa spinifera Hübner; Europe, Asia, Africa.

Mamestra brassicæ Linnæus and *M. albicolor* Hübner; Italy.



Fig. 103.—Tobacco cutworm (*Agrotis segetum*): Adult. (Targioni-Tozzetti.)

LITERATURE.

- TARGIONI-TOZZETTI, AD. *Animali ed Insetti del Tabacco en Erba e del Tabacco Secco*, 1891. Firenze-Roma.
- MAXWELL-LEFROY, H. F. *Indian Insect Pests*. 1906. Calcutta.
- LINDEMAN, K. VON. *Die Schädlichsten Insekten des Tabak in Bessarabia*. 1888. Moscow.
- MAXWELL-LEFROY, H. F. *Indian Museum Notes*, Vol. 3.
- VARIOUS AUTHORS in *Memoires Dept. Agr. India, Entomological Series*.
- HOWARD, C. W., in *Transvaal Agricultural Journal* during 1907 and 1908.
- FULLAWAY, D. T. *Hawaii Agr. Expt. Sta.*, 1914, Bul. 34.
- JONES, C. R. *Philippine Agr. Rev.*, 1913, v. 6, no. 9.

TODDY PALM.(*Phoenix sylvestris*. Family Palmaceæ.)

A palm much cultivated in India for its sap, which yields sugar and "toddy."
(See Palms.)

TOMATO.(*Lycopersicum esculentum*. Family Solanaceæ.)

The much-prized garden fruit grown very extensively in this country.

A. BETTER KNOWN TOMATO INSECTS LIKELY TO BE IMPORTED.***Desiantha nociva* Lea.**

(Tomato Weevil. Curculionidæ; Coleoptera.)

Host: Tomato, potato, and other vegetable plants.

Injury: Larvæ and adults feed on and destroy the plants. They are nocturnal feeders, hiding in the soil by day.

Description: Weevil elongate, about 12 mm. long, brown with black dots. *Larva* pea green in color. *Pupates* in cell in soil.

Distribution: Australia.

FRENCH, C. Handbook Destructive Insects Victoria, pt. 5, 1911, pp. 40-43, pl. 105.

FRENCH, C. Journ. Dep. Agr. Victoria, pp. 12, 13, Dec., 1913.



Fig. 104.—Tobacco cutworm (*Amsacta lactinea*): Adult. (Maxwell-Lefroy.)

***Lonchæa splendida*.**

(Metallic Tomato Fly. Trypetidæ; Diptera.)

Hosts: Tomato, potato, eggplant, other Solanaceæ.

Injury: Breeds in fruit, attacking perfectly healthy tomatoes.

Description: Fly, metallic bluish green or dark bronze green, wings smoky pink, head and legs black, body tapering, eyes large and prominent.

Distribution: New Zealand, Australia, Pacific Islands.

B. OTHER IMPORTANT TOMATO INSECTS.

LEPIDOPTERA.

Gelechiidæ.

**Phthorimæa operculella* Zeller. (See Potato.)

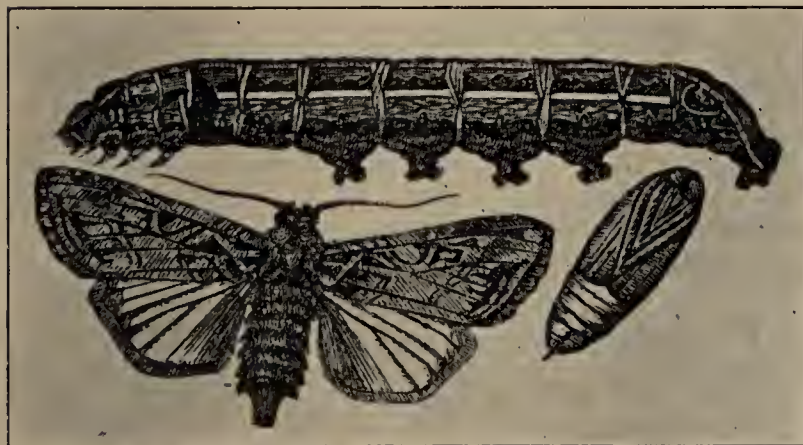


Fig. 105.—Tobacco cutworm (*Prodenia litura*): Larva, pupa, adult. (Maxwell-Lefroy.)

Noctuidæ.

Micromima olivia; Cuba; leaf roller on tomato, tobacco, and eggplant.

DIPTERA.

Trypetidæ.

Dacus cucurbitæ Coquillett; India, Ceylon, Hawaii; attacks fruit. (See Cucurbits.)

Ceratitis capitata Wiedemann; attacks fruit. (See Fruit.)

TOON.(*Cedrela toona*, etc. Family Meliaceæ.)

Tall ornamental trees of the Tropics; some species cultivated in California and the Gulf States.

AN INSECT INJURIOUS TO TOON.

LEPIDOPTERA.

Pyrallidæ.

Hypsipyla robusta Moore; India; bores in flowers, buds, fruit, and twigs of toon (*Cedrela toona*).

STEBBING, E. P. A Manual of Forest Zoology for India, 1908.

TROPICAL ALMOND.(*Terminalia* spp. Family Combretaceæ.)

Tropical plants, chiefly of the Old World, some of them with edible seed. *T. catappa* is cultivated in Florida and Porto Rico.

IMPORTANT TERMINALIA INSECTS.

THYSANOPTERA.

* *Heliothrips rubrocinctus* Giard; West Indies, Ceylon, Uganda, Florida. (See Avocado.)

COLEOPTERA.

Bostrychidæ.

Sinoxylon crassum Lesne; India; bores in wood of *Terminalia tomentosa*, *T. chebula*.

Sinoxylon anale Lesne; India; bores; in wood of *Terminalia bellerica*.

Lyctus spinifrons Lesne; India; bores in posts of *Terminalia tomentosa*.



Fig. 106.—Tobacco cutworm (*Triphaena pronuba*): Adult. (Targioni-Tozzetti.)

Buprestidæ.

Psiloptera viridans Kerremans; India; bores in wood of *Terminalia tomentosa*.

Chrysobothris indica Cast. et Gory; India; bores in wood of *Terminalia tomentosa*.

Cerambycidæ.

Æolsthes holosericea Fabricius; India; bores in wood of *Terminalia tomentosa*.

Brentidæ.

Ceocephalus carus Walker; India; bores in wood of *Terminalia tomentosa*.

Platypodidæ.

Platypus cupulatus Chapuis; India; bores in wood.

DIPTERA.

Trypetidæ.

Ceratitis capitata Wiedemann; attacks *Terminalia catappa*. (See Fruit.)

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

TURNIP; RUTABAGA.(*Brassica rapa*, *Brassica campestris*. Family Cruciferæ.)

These root crops will bear watching for root pests.

IMPORTANT TURNIP INSECTS.

Meligethes æneus Fabricius.

(Turnip Flower Beetle. Nitidulidæ; Coleoptera.)

Hosts: Turnip, rape, cabbage, and other crucifers.

Injury: Does considerable damage to the buds and flowers, causing stunted and shriveled appearance.

Description and biology: *Adult* metallic green, sometimes with a bluish shimmer; sides parallel, head and apex rounded, legs dark brown; fore tibiæ lighter, small externally saw-toothed; body 2–2.5 mm. long, 1.5–2 mm. broad. *Larva* yellowish white, head dark; mandibles with darker apex and a double row of short teeth; length 4.5 mm. During the first week in June the beetles may be found in numbers in blossoms, apparently feeding on the pollen. The eggs are deposited within the unopened buds. The larvæ feed in the buds and flowers and cause stunting and shriveling. Pupation takes place in earthen cells.

Distribution: Europe.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 474, figs. 288–289.

ORMEROD, E. A. Fifteenth Report Injurious Insects, London 1892, p. 96, fig. (adult).

Trichocera hiemalis.

(Winter Turnip Gnat. Mycetophilidæ; Diptera.)

Hosts: Turnip, cabbage.

Injury: Is found in connection with injury to roots of these crops, especially where a fungus disease known as “club,” “anbury,” etc., is present. There is a possibility that the gnat might be concerned in the spread of the fungus.

Distribution: England.

ORMEROD, E. A. Sixteenth Rept. Injurious Insects, 1892, pp. 147, 148.

Athalia spinarum Fabricius.

(Turnip Sawfly. Tenthredinidæ; Hymenoptera.)

Hosts Crucifers, turnips, beets, etc.

Injury: Defoliates.

Biology: Eggs laid in the leaves. Larvæ feed on the leaves. Pupates in earthen cocoon.

JABLONOWSKI. Tier. Feinde d. Zuckerrübe, pp. 298–303, fig. 60.

VIBURNUM.

(*Viburnum* spp. Family Caprifoliaceæ.)

Ornamental shrubs, including the black haw, the snowball, laurustinus, and many other desirable garden plants. They occur in America, Europe, Africa, Asia, and Java.

IMPORTANT VIBURNUM INSECTS.

HEMIPTERA.

Coccidæ:

Armored—

**Aspidiotus (Chrysomphalus) perseæ* Comstock; Mexico, England (Kew Gardens), Florida.

Aspidiotus spinosus Comstock; Italy; *Viburnum tinus*.

Chionaspis salicis Linnæus; Europe.

Parlatoria myrtus Maskell; South Australia.

Chionaspis (Phenacaspis) eugenizæ Maskell; Australia, China, Japan, Ceylon, Hawaii.

Unarmored—

**Lichtensia viburni* Signoret; France, England, Wales, Massachusetts.

Pseudococcus viburni Signoret; France, Maritime Alps.

Solenococcus muratæ Kuwana; Japan.

WALNUT AND BUTTERNUT.

(*Juglans* spp. Family Juglandaceæ.)

Hardy nut-bearing trees of Europe, Asia, and America. The nuts are all edible. The trees are valuable for shade and the wood is very valuable for furniture. The husks of the nuts are sometimes used for medicinal purposes or for tanning.

IMPORTANT WALNUT INSECTS.

HEMIPTERA.

Coccidæ.

Armored—

Aspidiotus (Diaspidiotus) juglandis Colvée; Spain; *Juglans regia*.*Diaspis leperii* Signoret; Europe; *Juglans cinerea*, *J. regia*.

Unarmored—

Lecanium coryli Linnæus; *Juglans nigra*, *J. regia*.

COLEOPTERA.

Cerambycidæ.

Cerambyx cerdo Linnæus; Europe; bores in wood. (See Oak.)*Oberea linearis* Linnæus; Europe; bores in pith of nursery stock. (See Hazel.)*Saperda scalaris* Linnæus; Europe; bores in wood and bark.

Curculionidæ.

Magdalis carbonaria Linnæus; Europe; bores in trunks. (See Birch.)*Alcides porrectirostris* Marshall; India; breeds in nuts of *Juglans regia*.

LEPIDOPTERA.

Cossidæ.

Cossus cossus Linnæus; goat moth; Europe; bores in wood. (See Willow.)

Tortricidæ.

Laspeyresia splendana Hübner; Europe. (See Chestnut.)*Laspeyresia grossana* Haworth; Europe. (See Beech.)*Laspeyresia amplana* Hübner; Europe. (See Hazel.)

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

WATERCRESS.

(Roripa nasturtium.)

A hardy market crop grown in moist soil, ditches, and water courses.

AN IMPORTANT WATERCRESS INSECT.

Limnophilus flavicornis Fabricius.

(Watercress Caddis Worm. Limnophilidæ; Trichoptera).

Hosts: Water cress, *Lemna*.*Injury:* The larvæ feed on the leaves.*Biology:* The larvæ are concealed in cases and live under water. The eggs are laid in gelatinous masses and are sometimes retained for a while at the extremity of the female's body, but are finally attached to some aquatic plant.*Distribution:* England.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 236.

WATERMELON.

See Cucurbits.

WHEAT; EMMER; SPELT.

(Triticum sativum Lam. and *Triticum* spp. Family Gramineæ.)

Wheat is grown in many parts of the world and is a standard article of commerce. The principal manner in which its insect enemies may be transported is in shipments of the grain, although the occasional use of straw in packing would be liable to introduce stem-infesting insects. The greater part of the world's wheat crop is grown in Europe. For full treatment of its insect pests see Grains and grasses.

WILLOW.

(Salix spp. Family Salicaceæ.)

Important trees along waterways in Europe and America. The wood is used in the manufacture of gunpowder and for many other purposes. Certain species are cultivated for materials with which to manufacture baskets.

A. BETTER KNOWN WILLOW INSECTS LIKELY TO BE IMPORTED.**Crepidodera aurata** Marsh.

(Willow Leaf Beetle. Chrysomelidæ; Coleoptera.)

Hosts: Willow, *Populus laurifolia*, *P. alba*.*Injury:* Feeds on foliage.*Distribution:* Throughout Europe.**Phyllodecta** spp.

(Willow Leaf Beetles. Chrysomelidæ; Coleoptera.)

Species: *P. vitellinae* Linnæus; Europe, Connecticut (introduced); willows (*Salix purpurea*, etc.), poplar. *P. vulgatissima* Linnæus; Europe; willows (*Salix viminalis*, etc.). *P. tibialis* Suffrian.; Europe; willow.

Injury: Feed on foliage in adult and larval stages.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 518.

Cossus cossus Linnæus.

(Goat Moth. Cossidæ; Lepidoptera.)

Hosts: Willow, poplar, alder, elm, oak, birch, linden, walnut, scotch pine, ash, beech, maple.

Injury: Bores in trees to the heartwood. Very serious, kills many trees.

Description and biology.—*Adult*, male wing expanse 68–75 mm., female 75–90 mm.; stout and clumsy, clothed with dense gray hairs, forewings dark gray and brown, with dusky transverse streaks; hind wings ashy gray to grayish brown with some indistinct brown marks; antennæ fringed with gray. Occurs June and July and flies at dusk.

Pupa, rich brown in color, with three rings of spines around abdomen. Pupation occurs in larval galleries; requires about a month. *Larva*, length 75–100 mm., dirty ocher-yellow, with broad, median dorsal, mahogany-red stripe; head blackish brown two deep-brown spots on first thoracic segment. Larval period about 3 years; tunnel in wood, occasionally leave trees. *Eggs*, brown, round, convex above, flattened below, ribbed; deposited in groups of 15 to 50 in crevices of bark; each female deposits 200 to 300 eggs, which hatch in about 10 days. (See text fig. 107.)

Distribution: Europe, Syria, Korea, North Africa.

THEOBALD, F. V. Insect Pests of Fruit, 1909, p. 42.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, p. 322.

NÜSSLIN, OTTO. Leitfaden der Forstinsektenkunde, 2d ed., 1913, p. 321, fig. 272.

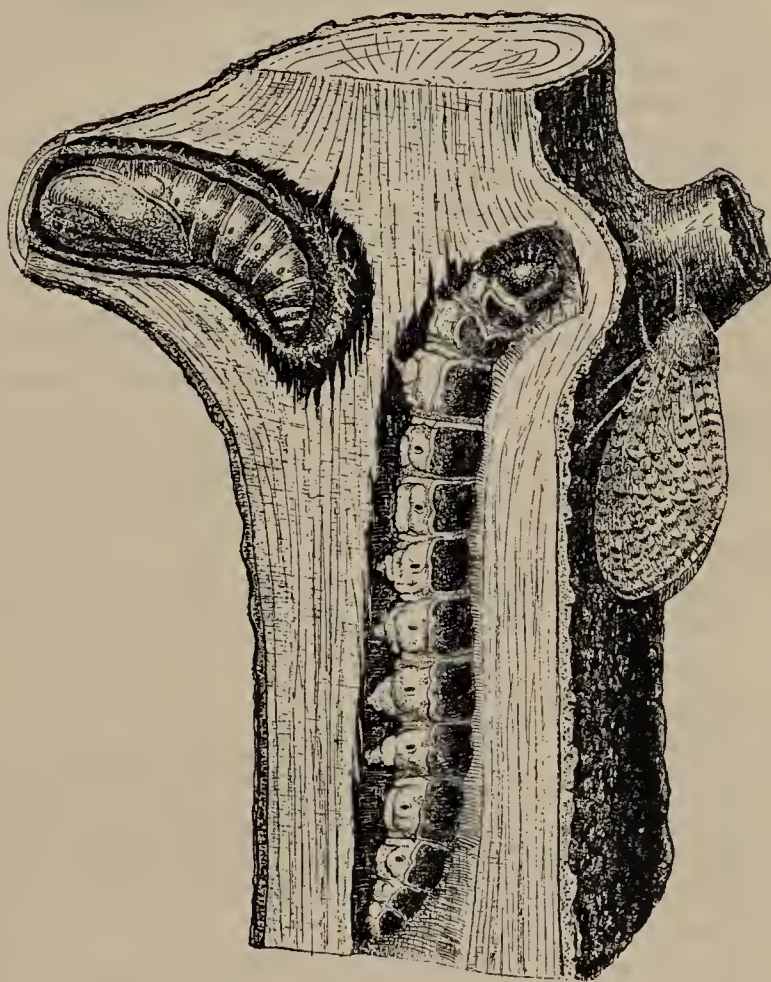


Fig. 107.—The goat moth (*Cossus cossus*): Larva, pupa and adult. (Henschel.)

Rhabdophaga spp.

(Willow Gall Midge. Itonididæ [Cecidomyiidæ]; Diptera.)

Species: *R. nielsonii* Kieffer; Denmark; willow. *R. saliciperda* Dufour; Europe; willow; *Populus alba*. *R. salicis* Schrk.; Europe; *Salix purpurea*.

Injury: Bore in wood and form gall-like formations.

Description and biology: *R. nielsonii* with head and thorax beneath yellowish red, thorax dark brown above; abdomen red; length 3 mm.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3, pp. 456, 457, fig. 277.

B. OTHER IMPORTANT WILLOW INSECTS.

ACARINA.

Eriophyidæ.

Eriophyes tetanothrix Nalepa, blister mite; England; attacks leaves of *Salix caprea*.

HEMIPTERA.

Aphididæ.

Lachnus viminalis Fonsc., plant louse; Germany; attacks shoots of *Salix viminalis*.

Coccidæ.

Armored—

Aspidiotus (Targionia) distincta Leonardi; Europe.

Chionaspis salicis Linnæus; Europe.

Unarmored—

Lecanium ciliatum Douglas; Europe.

Lecanium coryli Linnæus; Europe.

Phenacoccus aceris Signoret; Europe.

Pulvinaria betulæ Linnæus; Europe.

COLEOPTERA.

Anobiidæ.

Ptilinus fuscus Geoffroy; Europe; bores in dead wood of standing living trees.

Ptilinus pectinicornis Linnæus; Europe; bores in wood.

Buprestidæ.

Agilus serguttatus Brahm., Europe; bores in bark.

Pocilonota variolosa Paykull; Europe; bores in bark.

Scarabæidæ.

Amphimallon solstitialis Linnæus; Europe; larvæ attack roots of shoots.

Melolontha hippocastani Fabricius and *M. melolontha* Linnæus; Europe; larvæ attack roots of seedlings.

Cerambycidæ.

Æolesthes sarta Solsky; India; bores in trunks of *Salix alba* and *S. babylonica*.

Aromia moschati Linnæus; Germany; bores in stems and old cuttings.

Lamia textor Linnæus; Europe; bores in larger cuttings and shoots.

Oberca oculata Linnæus; Europe; bores in pith of twigs and stems.

Phymatodes lividus Rossi; Germany; particularly injurious to baskets; also, attacks felled trees and lumber.

Saperda carcharias Linnæus, **S. populnea* Linnæus; Europe; bore in bark and wood. The latter species occurs on the Pacific coast of the United States.

Chrysomelidæ.

Haltica quercetorum Foudr.; Europe; leaf beetle (see Oak); *H. ampelophaga* Guérin; Europe, Africa (see Grape).

Melasoma populi Linnæus; India; defoliator on *Salix elegans* and *S. babylonica*.

Curculionidæ.

Dorytomus affinis Paykull, *D. agnathus* Boheman, *D. dorsalis* Herbst, *D. maculatus* Marsham, *D. majalis* Paykull; Europe; the eggs are laid in the buds in the fall, and the larvæ develop in the flowers in the spring.

Orchestes decoratus Germar; Europe; mines the leaves of *Salix triandra*, *S. viridis*, *S. fragilis*, and *S. purpurea*.

Orchestes populi Fabricius; Europe; mines the leaves of *Salix viminalis*, and *S. triandra*.

**Cryptorhynchus lapathi* Linnæus; Europe, eastern United States; breeds in the stems and twigs.

LEPIDOPTERA.

Cossidæ.

**Zeuzera pyrina* Linnæus; Europe; bores in wood of basket willow. (See Horse-chestnut.)

Cymbidæ.

Earias chlorana Hübner; Europe; attacks foliage, buds, and shoots of long-leaf willows.

Geometridæ.

Anisopteryx æscularia Schiffermiller; Europe; feeds on foliage.

Larentia dilutata Borekh.; Europe; defoliator.

Lasiocampidæ.

Eriogaster lanestris Linnæus and *Malacosoma neustria* Linnæus; Europe; defoliators.

Gastropacha quercifolia Linnæus; Europe. (See Fruit.)

Lymantriidæ.

**Euproctis chrysorrhœa* Linnæus, **Lymantria monacha* Linnæus, **Porthetria dispar* Linnæus, **Orgyia antiqua* Linnæus, *Porthesia similis* Fuessly, and *Stilpnotia salicis* Linnæus; Europe; defoliators. (See Forest defoliators.)

Sesiidæ.

Sesia formicæformis Esp.; Europe; bores in stems and shoots.

HYMENOPTERA.

Cimbicidæ.

Cimbex variabilis Klug; Europe; sawfly, attacks leaves.

Pseudoclavellaria amerinæ Linnæus; a sawfly; Europe; defoliator.

Trichiosoma lucorum Linnæus; Europe; defoliator.

Tenthredinidæ.

Euura ater Jurine, *Pontania salicis* Christ, and *Pteronidea salicis* Linnæus; Europe; sawflies.

DIPTERA.

Itonididæ (Cecidomyidæ).

Cecidomyia saliciperda Dufour; Europe; breeds in branches of *Salix triandra*, *S. alba*, *S. fragilis*, *S. caprea*, and *S. purpurea*.

Cecidomyia salicis Schrank; Europe; breeds in shoots.

LITERATURE.

SORAUER, P. Handbuch der Pflanzenkrankheiten, 3d ed., 1913, vol. 3.

NÜSSLIN, O. Leitfaden der Forstinsektenkunde, 2d ed., 1913.

HESS, R. Der Forstschutz, 1900, vol. 2.

STEBBING, E. P. Indian Forest Insects, Coleoptera, 1914.

BARGAGLI, P. Rassegna Biologica Rincofori Europei, 1883-87.

LINDINGER, B. Die Schildläuse (Coccidæ), 1912.

YEW.

(*Taxus* spp. Family Taxaceæ.)

Ornamental evergreen trees or shrubs distributed throughout the northern hemisphere. The wood is valued for cabinetmaking. In studying the pests of this genus reference should also be made to Conifers.

Eriophyes psilaspis Nalepa.

(Yew Gall Mite. Eriophyidæ. Acarina.)

Host: Yew.

Injury: Forms gall-like swellings of the buds. Serious injury to hedges.

Description and biology: Four-legged blister mite, which causes galls by its feeding. Especially liable to introduction on nursery stock.

Distribution: England.

GILLANDERS, A. T. Forest Entomology, Edinburgh and London, 1908, p. 26, fig. 25.



THE WEST INDIAN SUGAR-CANE ROOT WEEVILS.
FIGS. 1, 2, 3.—Varieties of *Diaprepes abbreviatus*. (Pierce.)



THE AVOCADO WEEVIL (*HEILIPUS LAURI*). (BARBER, PROC. ENT. SOC. WASHINGTON.)

INSECT INDEX.

	Page.		Page.
<i>Abraxas grossulariata</i>	119	<i>Agromyza maura</i>	28, 29
<i>Acanthocinus ædilis</i>	73	<i>phaseoli</i>	37
<i>Acantholyda erythrocephala</i>	70	<i>simplex</i>	28, 29
<i>Acanthophorus serraticornis</i>	193	<i>Agrotis</i> sp.	6
<i>Acanthopsyche reidi</i>	211	<i>crinigera</i>	210
<i>snelleni</i>	211	<i>dislocata</i>	210
<i>Acanthoscelides obtectus</i>	6, 36, 165	<i>exclamationis</i>	44
<i>Acarina</i>	7	<i>interjectionis</i>	208
<i>Acherontia atropos</i>	185	<i>plecta</i>	44
<i>Acheta bimaculata</i>	89	<i>saucia</i>	210
<i>Acidia heraclei</i>	52, 164	<i>segetum</i>	44, 70, 216
<i>Aclerda distorta</i>	33	<i>spina</i>	185
<i>japonica</i>	33, 206	<i>tritici</i>	75
<i>tokionis</i>	33	<i>trux</i>	216
<i>Acmæodera stictipennis</i>	193	<i>vestigialis</i>	70
<i>Acridium æruginosum</i>	205	<i>ypsilon</i>	8, 14
<i>flavicorne</i>	205	<i>Akermes levis</i>	9
<i>hieroglyphicum</i>	89	<i>punctatus</i>	59
<i>luteicorne</i>	205	<i>scrobiculatus</i>	9
<i>migratorium</i>	215	<i>Alaus sculptus</i>	193
<i>peregrinum</i>	89	<i>Alcides porrectirostris</i>	220
<i>roseum</i>	205	<i>scenicus</i>	103
<i>succinctum</i>	205	Alder bud moth (see <i>Coleophora fuscadinella</i>).	
<i>zehntneri</i>	205	<i>Aleurocanthus uoglumi</i>	56
<i>Acridocephala bistrata</i>	195	<i>Aleurodicus cocois</i>	34, 109, 132, 139
<i>Acrocynus accentifer</i>	59	<i>destructor</i>	159
<i>Acronycta aceris</i>	40	<i>Aleurolobus longicornis</i>	207
<i>Adelocera modesta</i>	212	<i>olivinus</i>	155
<i>Adoretus umbrosus</i>	50, 59, 90, 131, 191, 207, 215	<i>Aleurothrixus porteri</i>	56
<i>tenuimaculatus</i>	50, 59, 90, 191, 210	<i>Aleyrodes</i> spp.	213
<i>Adoxus obscurus</i>	6	<i>lactea</i>	207
<i>Ænaria lewisi</i>	190	<i>tabaci</i>	213
<i>Æolesthes holosericea</i>	193, 218	<i>Aleyrodidæ</i>	7
<i>sarta</i>	96, 171, 181, 222	Alfalfa gall midge (see <i>Asphondylia miki</i>).	
<i>Æolus vittatus</i>	207	leaf weevil (see <i>Hypera murina</i>).	
<i>Æsiotes notabilis</i>	195	weevil of Europe (see <i>Hypera postica</i>).	
<i>Agelastica alni</i>	12, 46	<i>Aloha ipomææ</i>	210
<i>Agrilus angustulus</i>	39, 134, 153	Amar caterpillar (see <i>Virachola insocrates</i>).	
<i>betuleti</i>	73	<i>Amatissa consorta</i>	211
<i>biguttatus</i>	39, 153	Ambrosia beetles (see <i>Anisandrus</i> spp.; <i>Xyl-</i>	
<i>elongatus</i>	39, 153	<i>otenus</i> spp.).	
<i>sexguttatus</i>	181, 222	<i>Amorbia emigratella</i>	210
<i>sinuatus</i>	5, 169	<i>Amphimallon solstitialis</i>	39, 73, 137, 181, 222
<i>subauratus</i>	134, 153	<i>Amsacta lactinea</i>	216, 217
<i>viridis</i>	12, 39, 46, 73, 131, 141, 148, 150, 181, 192	<i>lineola</i>	216
<i>Agriotes aterrimus</i>	68, 153	<i>moorei</i>	216
<i>formosanus</i>	207	<i>Anagnia splendens</i>	206
<i>lineatus</i>	43, 49, 51, 68, 85, 126, 137, 140, 153, 165, 166, 184, 214	<i>Anastrepha acidusa</i> (see <i>Anastrepha fratercu-</i>	
<i>obscurus</i>	68, 153	<i>lus</i>).	
<i>pilosus</i>	214	<i>fraterculus</i>	60,
<i>sacchari</i>	207	64, 94, 100, 113, 132, 147, 164, 170, 180	
<i>taichuensis</i>	207	<i>ludens</i>	60, 114, 132, 167, 180, 194
<i>Agromyza fabalis</i>	38	<i>peruviana</i>	114
<i>frontalis</i>	136	<i>serpentina</i>	132
		<i>Anaxiphus pallidulus</i>	205

	Page.		Page.
<i>Andraca bipunctata</i>	212	<i>Apiomorpha urnalalis</i>	99
<i>Anerastia ablutella</i>	208	<i>variabilis</i>	99
<i>botella</i>	126	<i>Apion armipes</i>	87
Angoumois grain moth (see <i>Sitotroga cereal-</i>		<i>meliloti</i>	14
<i>ella</i>).		<i>tenue</i>	14
<i>Anisandrus dispar</i> . 12, 40, 46, 54, 137, 138, 148, 154, 171		<i>xanthostylum</i>	87
<i>Anisolabris maritima</i>	215	<i>Apodcrus coryli</i>	12, 39, 46
<i>Anisopteryx æscularia</i>	12,	<i>Apogonia destructor</i>	199
24, 46, <u>105</u> , 134, 138, 154, 170, 179, 192, 223		<i>ritscmæ</i>	199
Annona fruit fly (see <i>Ceratitis anonæ</i>).		Apple blossom weevil (see <i>Anthonomus pomorum</i>).	
<i>Anomala ænea</i>	46, 207	borer (see <i>Cossus tristis</i>).	
<i>grandis</i>	12	clearwing (see <i>Sesia myopæformis</i>).	
<i>vitis</i>	<u>127</u> , 190	ermine moth (see <i>Hyponomeuta malinellus</i>).	
<i>Anomalococcus cremastogastri</i>	102	gum borer (see <i>Bimia femoralis</i>).	
<i>Anonæpestis bengalella</i>	93	moth (see <i>Argyrocthia conjugella</i>).	
<i>Anoplus plantaris</i>	46	pith moth (see <i>Blastodacna putripennella</i>).	
<i>Anthaxia osmastonii</i>	73	psylla (see <i>Psylla mali</i>).	
<i>quadripunctata</i>	68	root borer (see <i>Leptops hopci</i>).	
<i>Anthomyia radicum</i>	50, <u>187</u>	sawfly (see <i>Hoplocampa testudinea</i>).	
<i>Anthonomus druparum</i>	179	stem piercer (see <i>Magdalis barbicornis</i>).	
<i>grandis</i>	87	tree borer (see <i>Rhizopertha collaris</i>).	
<i>incurvus</i>	23	Apricot scale (see <i>Epidiaspis pyricola</i>).	
<i>pedicularius</i>	23, 170	<i>Apriona cinerica</i>	150
<i>pomorum</i>	<u>18</u> , 170	<i>germari</i>	150
<i>pyri</i>	23, 170	<i>Aradus cinnamomeus</i>	73
<i>rectirostris</i>	174	<i>Aræcerus fasciculatus</i>	6, 55, <u>84</u> , 91
<i>rubi</i>	47, 197	<i>Argæ rosæ</i>	192
<i>spinotus</i>	170	Argentine potato weevil (see <i>Rhigopsidius tucumanus</i>).	
<i>vestitus</i>	87	<i>Argyrocthia conjugella</i>	6, <u>20</u> , 149, 180
<i>Anthores asperula</i>	63	<i>ephippella</i>	<u>134</u> , <u>175</u>
<i>Anticyra combusta</i>	208	<i>fundella</i>	70
<i>Antonina crawii</i>	33	<i>illuminatella</i>	82
<i>socialis</i>	33	<i>lævigatella</i>	<u>83</u> , 84
<i>Aonidia</i> (see <i>Aspidiotus</i> [<i>Aonidia</i>]).		<i>nitidella</i>	<u>132</u> , <u>175</u>
<i>Aonidiella</i> (see <i>Aspidiotus</i> [<i>Aonidiella</i>]).		<i>Argyroplote illepidæ</i>	11
<i>Apate molle</i>	67	Army worm (see <i>Cirphis unipuncta</i>).	
<i>monachus</i>	30, <u>56</u> , 63, 166, 179	Army worms	8
<i>Aphanistichus consanguineus</i>	199	<i>Aroa socrus</i>	208
<i>Aphrastasia pectinatæ</i>	67	<i>Aromia moschata</i>	222
<i>Aphis avcnæ</i>	5	<i>Ascelis attenuata</i>	99
<i>brassicæ</i>	5	<i>echiniformis</i>	99
<i>gossypii</i>	5	<i>præmollis</i>	99
<i>rumicis</i>	5, 43	<i>schraderi</i>	99
<i>Apiomorpha attenuata</i>	98	Ash gall mite (see <i>Eriophyes fraxini</i>).	
<i>bäueriæni</i>	98	<i>Asiphum tremulæ</i>	181
<i>catycina</i>	98	Asparagus fly (see <i>Platyparæa pœcilopectera</i>).	
<i>conica</i>	98	leaf beetles (see <i>Crioceris</i> spp.).	
<i>duplex</i>	98	miners (see <i>Agromyza</i> spp.).	
<i>ellipsoidalis</i>	98	<i>Asphondylia miki</i>	15, 16
<i>floralis</i>	98	<i>Aspidiotus alatus</i>	98
<i>helmsii</i>	98	<i>britannicus</i>	5, 35
<i>karschi</i>	98	<i>camelliæ</i>	5
<i>maliformis</i>	98	<i>confusus</i>	98
<i>minor</i>	98	<i>destructor</i>	163
<i>munita</i>	99	<i>fissidens pluridentatus</i>	162
<i>ovicola</i>	99	<i>maderensis</i>	139
<i>ovicoloides</i>	99	<i>minus</i>	152
<i>pedunculata</i>	99	<i>pangocnsis</i>	162
<i>pharetrata</i>	99	<i>pectinatus</i>	169
<i>pileata</i>	99	<i>perniciosus</i>	5
<i>pomiformis</i>	99	<i>persearum</i>	30
<i>rugosa</i>	99	<i>rapax</i> (see <i>A. camelliæ</i>).	
<i>sessilis</i>	99	<i>spinosus</i>	162, 219
<i>sloanei</i>	99		
<i>strombylosa</i>	99		
<i>thorntoni</i>	99		
<i>umbellata</i>	99		

	Page.		Page.
<i>Aspidiotus tasmaniae</i>	9, 98	<i>Aspidiotus (Targionia) bromeliæ</i>	171
<i>tayabanus</i>	192	<i>distincta</i>	152, 222
<i>varians</i>	162	<i>glomerata</i>	206
<i>Aspidiotus (Aonidia) ebeni</i>	170	<i>sacchari</i>	206
<i>lauri</i>	35, 72, 169	<i>vitis</i>	130, 152
<i>oleæ</i>	156	<i>Aspidomorpha militaris</i>	210
<i>planchonioides</i>	102	<i>sanctæcrucis</i>	212
<i>pinicola</i>	72	<i>Aspidoproctus giganteus</i>	194
<i>Aspidiotus (Aonidiella) cocotiphagus</i>	102	<i>Asterolecanium aureum</i>	158
<i>miniatæ</i>	98	<i>bambusæ</i>	33, 206
<i>subcuticularis</i>	102	<i>bambusicola</i>	33
<i>subrubescens</i>	58	<i>ceriferum</i>	162
<i>Aspidiotus (Chrysomphalus) albopictus</i>	58	<i>coffææ</i>	63
<i>alienus</i>	44, 158	<i>coronatum</i>	33
<i>ansei</i>	162	<i>epidendri</i>	158
<i>dictyospermi</i>	5	<i>exiguum</i>	33
<i>pin-</i>		<i>flavociliatum</i>	33
<i>nuli-</i>		<i>hemisphæricum</i>	33
<i>fera</i>	58	<i>hilli</i>	162
<i>kæbelei</i>	58	<i>lanceolatum</i>	33
<i>nigropunctatus</i>	26, 156	<i>lineare</i>	162
<i>paulistus</i>	35	<i>masuii</i>	33
<i>pedroniformis</i>	130	<i>miliaris</i>	33
<i>perseæ</i> 5, 30, 158, 162, 219		<i>palmæ</i>	162
<i>personatus</i>	30,	<i>pudibundum</i>	33
58, 93, 102, 145, 156, 162		<i>pustulans</i>	102
<i>portoricensis</i>	158	<i>rubrocomatum</i>	33
<i>prosimus</i>	162	<i>solenophoroides</i>	33
<i>scutiformis</i> 30, 35, 59, 162		<i>tenuissimum</i>	33
<i>Aspidiotus (Diaspidiotus) africanus</i>	23, 24,	<i>tumidum</i>	33
102, 169, 186		<i>udagamæ</i>	33
<i>coloratus</i>	158	<i>urichi</i>	162
<i>juglandis</i>	220	<i>variolosum</i>	5, 153
<i>orientalis</i>	5, 59, 162	<i>ventruosum</i>	9
<i>ostreæformis</i>	5, 166, 169	<i>Asthenia pygmæana</i>	70
<i>patavinus</i>	178	<i>Astycus lateralis</i>	212
<i>pyri</i>	132, 169	<i>Athalia spinarum</i>	44, 219
<i>zonatus</i>	152	<i>Athous hirtus</i>	79
<i>Aspidiotus (Evaspidiotus) labiatarum</i>	130	<i>niger</i>	43, 214
<i>Aspidiotus (Hemiberlesia) palmæ</i>	162	<i>subfuscus</i>	39, 134, 137, 153
<i>simillimus</i>	162	<i>Atomaria linearis</i>	41
<i>Aspidiotus (Morganella) longispina</i>	145	<i>Atractomorpha bedeli</i>	205
<i>maskelli</i>	102, 146	<i>crenulata</i>	205, 215
<i>Aspidiotus (Odonaspis) bambusarum</i>	32	<i>psittacina</i>	205
<i>canaliculata</i>	32	<i>Aulacaspis cinnamomi</i>	146
<i>inusitata</i>	32	<i>javanensis</i>	32
<i>secreta</i>	32	<i>miranda</i>	93
<i>saccharicaulis</i>	32, 206	<i>Aulacophora olivieri</i>	92, 166
<i>Aspidiotus (Pseudaonidia) articulatus</i>	30,	Austrian alfalfa leaf weevil (see <i>Hypera melcs</i>).	
59, 63, 102, 130, 131,		<i>Autosticha pelodes</i>	208
146, 156, 158, 162, 192		Avocado weevil (see <i>Heilipus lauri</i>).	
<i>clavigera</i>	59, 102, 146, 166	<i>Bactrocera cucurbitæ</i>	24, 25, 38
<i>duplex</i>	59, 156	<i>tryoni</i>	24, 25,
<i>fimbriatus</i>	59	34, 38, 60, 93, 114, 142, 147, 167, 187	
<i>fossor</i>	130	<i>zonatus</i>	147
<i>obsita</i>	102	<i>Balaninus</i> (See <i>Curculio</i>).	
<i>quadriareolata</i>	9	Bamboo borer (see <i>Dinoderus distinctus</i> ; <i>Euco-</i>	
<i>silvatica</i>	102	<i>soma paragramma</i> .)	
<i>tesserata</i>	130	fruit fly (see <i>Ceratitis striata</i>).	
<i>trilobitiformis</i>	59,	shot-hole borer (see <i>Dinoderus pili-</i>	
102, 131, 146, 162		<i>frons</i>).	
<i>Aspidiotus (Pseudischinaspis) bowreyi</i>	192	Banana fruit fly (see <i>Dacus curvipennis</i>).	
<i>linearis</i>	162	root borer (see <i>Cosmopolites sordidus</i>).	
<i>longissima</i>	146	Banded pumpkin beetle (see <i>Aulacophora</i>	
<i>Aspidiotus (Targionia) acaciæ</i>	9	<i>olivieri</i>).	
<i>alni</i>	11, 152	<i>Baræus sordidus</i>	63
<i>biformis</i>	5, 158	<i>Baris chlorizans</i>	49
<i>cattleyæ</i>	158		

	Page.		Page.
<i>Baris cærulescens</i>	49	Boll worms (see <i>Diparopsis castanea</i> ; <i>Earias</i> spp.; <i>Sacadodes pyralis</i>).	
<i>glabra</i>	49	<i>Bostrychopsis jesuita</i>	59
<i>lepidii</i>	49	<i>parallela</i>	33
<i>opiparis</i>	49	<i>Bostrychus capucinus</i>	53, 153
<i>saccharivora</i>	207	<i>Bothynoderes farinosus</i>	44
<i>trægardhi</i>	92	<i>punctiventris</i>	44
<i>viridisericæa</i>	49	<i>Botys cælesalis</i>	208
Bark beetles.....	8	<i>Brachonyx pineti</i>	74
borer (see <i>Leptostylus præmorsus</i>).		<i>Brachycerus albidentatus</i>	158
Tortrix (see <i>Laspeyresia wæberiana</i>).		<i>corrosus</i>	158
<i>Barynotus squamosus</i>	49	<i>pradierii</i>	158
<i>Basilianus cantori</i>	46	<i>undatus</i>	158
<i>Batocera albofasciata</i>	103	<i>Brachyderes incanus</i>	46
<i>boisduvali</i>	101	<i>lusitanicus</i>	154
<i>frenchi</i>	103	<i>Brachyrhinus</i> (<i>Otiorhynchus</i> spp.).....	65, 128
<i>rubra</i>	103	<i>armadillo</i>	65
<i>titana</i>	146, 147	<i>armatus</i>	129
<i>Bathyscia wollastoni</i>	184	<i>asphaltinus</i>	129
Bean aphid (see <i>Aphis rumicis</i>).		<i>aurifer</i>	65
fly (see <i>Agromyza phaseoli</i>).		<i>corruptor</i>	129, 167
leaf beetle (see <i>Cerotoma denticornis</i>).		<i>egregius</i>	65
roller (see <i>Eudamus proteus</i>).		<i>fullo</i>	65
pod borer (see <i>Maruca testulalis</i>).		<i>fuscipes</i>	65
stem maggot (see <i>Agromyza fabalis</i>).		<i>globus</i>	129
weevils.....	8	<i>inflatus</i>	65
weevil (see <i>Acanthoscelides</i> spp.; <i>Mylabris</i> spp.; <i>Pachymerus</i> spp.)		<i>irritans</i>	65
<i>Bedellia minor</i>	210	<i>jovis</i>	65
<i>orchilella</i>	210	<i>kratterii</i>	65
<i>somnulentella</i>	210	<i>lævigatus</i>	173
Beech tortricid (see <i>Peronea ferrugana</i>).		<i>lepidopterus</i>	65
tortrix (see <i>Laspeyresia grossana</i>).		<i>ligustici</i>	44, 129, 167
Beet army worm (see <i>Laphygma exigua</i>).		<i>morio</i>	65
carrion beetle (see <i>Blitophaga opaca</i>).		<i>multipunctatus</i>	65
fly or Spinach leaf miner (see <i>Pegomya hyoscyami</i>).		<i>niger</i>	65
root weevil (see <i>Cleonus punctiventris</i>).		<i>orbicularis</i>	44
tortoise beetle (see <i>Cassida nebulosa</i>).		<i>ovatus</i>	6, 65
worm (see <i>Plusia gamma</i>).		<i>perdix</i>	65
<i>Belippe albiguttata</i>	212	<i>picipes</i>	197
<i>Bemisia giffardi</i>	56	<i>populeti</i>	129
<i>Bembecia hylæiformis</i>	47	<i>raucus</i>	44, 129
Bibitkever (see <i>Entochira lateralis</i>).		<i>sensitivus</i>	65
<i>Bimia femoralis</i>	98	<i>septentrionis</i>	65
Birch blister mite (see <i>Eriophyes rudis</i>).		<i>singularis</i>	65, 129
twig weevil (see <i>Magdalis carbonaria</i>).		<i>sulcatus</i>	6, 129
<i>Biston hirtarius</i>	110, 111, 179	<i>tenebricosus</i>	47, 197
<i>pomonarius</i>	110, 154	<i>teretirostris</i>	129
<i>suppressarius</i>	10, 211	<i>tristis</i>	129
<i>Bixadus sierricola</i>	63	<i>turca</i>	129
Black alfalfa leaf beetle (see <i>Colaspidema atrum</i>).		<i>Brachytrypes achatinus</i>	14, 215
scale (see <i>Saissetia oleæ</i>).		<i>Brachyrhynchus subsignatus</i>	52, 68
<i>Blaps armata</i>	73	Brazil fig borer (see <i>Heilipus bonelli</i>).	
<i>mucronata</i>	216	Broad-nosed grain weevil (see <i>Caulophilus latinasus</i>).	
<i>Blastodacna hellerella</i>	20	<i>Bromius obscurus</i>	127
<i>putripenella</i>	19	<i>vitis</i>	127
<i>vinolentella</i>	19	<i>Brontispa froggatti</i>	160
Blister beetle (see <i>Epicauta rufidorsum</i>).		Broun's fruit fly (see <i>Dacus</i> [<i>Tephrites</i>] <i>xanthodes</i>).	
<i>Blitophaga opaca</i>	5, 43	Brown hard-back beetle (see <i>Phytalus smithi</i>).	
<i>undata</i>	43	plum owl moth (see <i>Xylina socia</i>).	
Blue or hairstreak butterfly (see <i>Lycæna bætica</i>).		Brown-tail moth (see <i>Euproctis chrysorrhæa</i>).	
<i>Boarmia crepuscularia</i>	55, 96	Bruchus (see <i>Mylabris</i> spp.).	
<i>gemmaria</i>	129, 192	Brush spinner (see <i>Orgyia gonostigma</i>).	
<i>selanaria</i>	194	<i>Bryobia ribis</i>	119
		Bud stinger (see <i>Janus compressus</i>).	

	Page.		Page.
Buff tip moth (see <i>Phalera bucephala</i>).		<i>Cerambyx miles</i>	131
<i>Bupalus piniarius</i>	66	<i>scopolii</i>	23, 169
<i>Buprestis geometrica</i>	73	<i>Ceratitis anonæ</i>	51, 94, <u>115</u> , 132
<i>Bytiscus betulæ</i>	12, 39, 46	<i>capitata</i> ... 24, 25, 30, 34, 38, 60, 64, 93, 94, 100,	
<i>Byturus tomentosus</i>	47	103, <u>115</u> , 116, 126, 131, 132, 133, 140, 142, 147,	
Cabbage aphid (see <i>Aphis brassicæ</i>).		163, 167, 170, 171, 180, 186, 187, 194, 217, 218	
gall midge (see <i>Dasyneura brassicæ</i>).		<i>catoirei</i>	58
maggot (see <i>Phaonia trimaculata</i>).		<i>giffardi</i>	<u>116</u> , 139
midge (see <i>Contarinia torquens</i>).		<i>nigerrima</i>	116
webworm (see <i>Hellula undalis</i>).		<i>punctata</i>	51, <u>116</u> , 126, 132, 147
worm (see <i>Pieris monustè</i>).		<i>rubivora</i>	116
Cacao fruit fly (see <i>Ceratitis punctata</i>).		<i>silvestrii</i>	<u>116</u> , 139
moth (see <i>Zaratha cramerella</i>).		<i>striata</i>	32
Cadelle (see <i>Tenebrioides mauritanicus</i>).		<i>Ceratopachys variabilis</i>	148
<i>Calamistis fusca</i>	85	<i>Cerococcus ornatus</i>	63
<i>Calamobius marginellus</i>	126	<i>Ceronema caudata</i>	99
<i>Calathus fuscipes</i>	81	<i>Ceroplastes actiniformis</i>	162
<i>Calendra granaria</i>	6	<i>campinensis</i>	131
<i>linearis</i>	210	<i>ceriferus</i>	63, 102
<i>oryza</i>	6	<i>cistudiformis</i>	30
<i>rugicollis</i>	210	<i>denudatus</i>	94
<i>sculpturata</i>	154	<i>erithræus</i>	9
California grape rootworm (see <i>Adorus obscurus</i>).		<i>ficus</i>	102
<i>Caliroa æthiops</i>	6	<i>gowdeyi</i>	102
<i>Callidium æneum</i>	39, 54, 153	<i>grandis</i>	131
<i>violaceum</i>	39	<i>mimosæ</i>	9
<i>Calocampa exoleta</i>	44	<i>myricæ</i>	102, 162
<i>Calocoris fulvomaculatus</i>	136	<i>psidii</i>	131
<i>Caloptenus italicus</i>	215	<i>quadrilineatus</i>	94, 102
<i>Camarimena rugosistriatus</i>	52	<i>rubens</i> 30, 102, 146, 162, 169, 170	
<i>Camarota flavitarsis</i>	125	<i>rusci</i> 102, 132, 150, 156, 171, 181	
<i>Camponotus ligniperda</i>	11	<i>singularis</i>	131
Cane grasshopper (see <i>Atractomorpha crenulata</i>).		<i>theobromæ</i>	33
leafhopper (see <i>Pyrilla aberrans</i>).		<i>townsendi percrassus</i>	102
root borer (see <i>Polyocha saccharella</i>).		<i>vinsonii</i>	131, 142, 146
sucker moth (see <i>Castnia licus</i>).		<i>vinsonioides</i>	63
<i>Cantharis fusca</i>	73	<i>Ceroputo yuccæ</i>	94, 102
<i>Capnodis indica</i>	73	<i>Cerostoma parenthesesella</i>	40
<i>miliaris</i>	181	<i>Cerotoma denticornis</i>	38
<i>tcnebrionis</i>	<u>110</u> , 179	<i>Cetonia lugubris</i>	216
<i>Capua angustiorana</i>	24, <u>131</u> , 170	<i>Ceutorhynchus assimilis</i>	187, 188
<i>Caradrina exigua</i> (see <i>Laphygma</i>).		<i>contractus</i>	92
<i>Cardiococcus umbonatus</i>	131	<i>cyanipennis</i>	49
<i>Cardiophorus devastans</i>	207	<i>quadridens</i>	49, 188
<i>formosanus</i>	207	<i>raphani</i>	187
<i>Carphoborus minimus</i>	74	<i>robertii</i>	187
<i>Carpocapsa</i> (see <i>Laspeyresia</i>).		<i>sulcicollis</i>	49, 188
<i>Carpomyia pardalina</i>	93	<i>Chætocnema basalis</i>	191
<i>Caryoborus gonagra</i>	149, 210	<i>concinna</i>	189
<i>Cassida nebulosa</i>	6, <u>41</u> , 158	<i>tibialis</i>	44
<i>vittata</i>	44	<i>Chætococcus bambusæ</i>	33
Castilloa borer (see <i>Inesida leprosa</i>).		<i>Chætosticha nana</i>	208
<i>Castnia licus</i>	34, 159, <u>202</u>	<i>Chalcoides chloris</i>	44
Catalpa scale (see <i>Diaspis pentagona</i>).		<i>Charagia lignivora</i>	10, <u>20</u> , 100
<i>Catorama tabaci</i>	214	Charlock weevil (see <i>Ceutorhynchus contractus</i>).	
<i>Caulophilus latinasus</i>	6, 30	<i>Cheimatobia boreata</i>	40, 46, 179
<i>Cecidomyia humuli</i>	135	<i>brumata</i>	24, <u>105</u> , 148, 154, 179
<i>saliciperda</i>	223	<i>Chermes abietis</i>	67
<i>salicis</i>	223	<i>viridis</i>	67
Celery fly (see <i>Acidia heraclei</i>).		Cherry borer (see <i>Cryptophaga unipunctata</i>).	
leaf tyer (see <i>Phlyctænia ferrugalis</i>).		bug (see <i>Peltophora pedicillata</i>).	
<i>Ceocephalus carus</i>	218	ermine moth (see <i>Hyponomeuta padellus</i>).	
<i>Cephalcia hypotrophica</i>	70	fruit moth (see <i>Argyresthia nitidella</i>).	
<i>signata</i>	70	green beetle (see <i>Diphucephala colaspoides</i>).	
<i>Cephus pygmæus</i>	126	spinner (see <i>Biston hirtarius</i>).	
<i>Cerambyx cerdo</i>	26, <u>151</u> , 153, 220		

	Page.		Page.
Cherry tree case-bearer (see <i>Coleophora anatipennella</i>).		<i>Cionus fraxini</i>	27, 157
weevil (see <i>Curculio cerasorum</i>).		<i>scrophulariæ</i>	44
Chestnut weevil (see <i>Curculio elephas</i>).		<i>Cirphis leucosticha</i>	85
<i>Chilo auricilia</i>	85, 189, 196, 208	<i>unipuncta</i> (<i>Heliophila</i> , <i>Leucanix</i>).....	8, 208
<i>infuscatella</i>	208	Citrus leaf miner (see <i>Phyllocnistis citrella</i>).	
<i>simplex</i>	85, 126, 191, 196, 203	<i>Cladius pectinicornis</i>	6
<i>Chionaspis arundinariæ</i>	32	<i>Clania crameri</i>	55, 64, 76, 211
<i>austriaca</i>	72	<i>holmsi</i>	211
<i>bambusæ</i>	32	<i>variegata</i>	55, 64, 211
<i>berlesei</i>	29	<i>Cleonus cinereus</i>	44
<i>colmani</i>	32	<i>fasciatus</i>	44
<i>depressa</i>	206	<i>mendicus</i>	44
<i>elongata</i>	32	<i>pedestris</i>	44
<i>frenchi</i>	98	<i>piger</i>	44
<i>graminis</i>	32	<i>punctiventris</i>	41, 216
<i>hikosani</i>	32	<i>tigrinus</i>	44
<i>inday</i>	162	<i>ucrainicnsis</i>	44
<i>madiunensis</i>	206	<i>Cletus bipunctatus</i>	207
<i>manni</i>	102	<i>trigonus</i>	207
<i>nerii</i>	156	<i>Clinodiplosis equestris</i>	123, 124
<i>saccharifolii</i>	206	<i>mosellana</i>	123, 126
<i>salicis</i>	11, 26, 45, 48, 95, 121, 141, 147, 152, 181, 219, 222	Clover leaf weevils (see <i>Hypera</i> spp.).	
<i>samoana</i>	162	root weevils (see <i>Sitona</i> spp.).	
<i>simplex</i>	32	<i>Clysia ambiguella</i>	129, 130
<i>striata</i>	25, 94, 139	<i>Clytus floralis</i>	14
<i>substriata</i>	162	<i>tropicus</i>	153
<i>tegalensis</i>	206	<i>Cnaphalocrocis bifurcalis</i>	208
<i>vitis</i>	130, 146	<i>Cnaphalodes lapponicus</i>	67
<i>Chionaspis</i> (<i>Phenacaspis</i>) <i>bupleuri</i>	156	<i>strobilobius</i>	67
<i>cockerelli</i>	162	<i>Cncorhinus albigitatus</i>	207
<i>dilatata</i>	146, 162	<i>plagiatus</i>	29, 51
<i>eugeniæ</i>	146, 219	<i>Cnethocampa pinivora</i>	71, 76
<i>megaloba</i>	131	<i>pityocampa</i>	71, 76
<i>natalensis</i>	146	<i>processiona</i>	152
<i>Chloridca assulta</i>	216	Coccidae.....	7
<i>obsolcta</i>	6, 14	<i>Coccotrypes integer</i>	193
<i>peltigera</i>	216	<i>Coccus acuminatus</i>	35, 131, 146, 158
<i>Chloroclystis rectangulata</i>	20	<i>acutissimus</i>	44, 146, 162
<i>Chlorops lineata</i>	126	<i>arundinariæ</i>	33
<i>teniopus</i>	125	<i>bicruciatu</i> s.....	170
<i>Cholus cattleyæ</i>	159	<i>hesperidum</i>	59, 162, 212
<i>forbesi</i>	159	<i>hoferi</i>	23
<i>Chortophila cilicrura</i>	29, 157	<i>mangiferæ</i>	5, 146
<i>Chortophila</i> (<i>Pegomya</i>) <i>brassicæ</i>	7	<i>manniparus</i>	211
<i>cepetorum</i>	7	<i>marsupialis</i>	94
<i>fusciceps</i>	7, 38, 50	<i>minimus</i>	44, 158
<i>hyoscyami</i>	7, 42, 158, 196	<i>viridis</i>	59, 63, 131, 212
<i>Chramesus globulus</i>	154	Cochylis (see <i>Clysia ambiguella</i>).	
<i>Chrotogonus trachypterus</i>	14, 89, 215	Cockchafer (see <i>Melolontha melolontha</i>).	
<i>Chrysobothris affinis</i>	153	Cornut leaf-miner beetles (see <i>Promecotheca</i> spp.).	
<i>indica</i>	218	leaf moth (see <i>Levuana iridescens</i>).	
<i>sernotata</i>	193	palm scale [see <i>Aspidiotus</i> (<i>Chrysomphalus</i>) <i>perscæ</i>].	
<i>solicri</i>	73	white fly (see <i>Alcurodicus</i> spp.).	
<i>Chrysochroa bicolor</i>	50	Codling moth (see <i>Laspeyresia pomonella</i>).	
<i>fulminans</i>	50	<i>Calosterna scabrata</i>	193
<i>Chrysolophus spectabilis</i>	10	<i>spinator</i>	10
<i>Chrysomphalus</i> [see <i>Aspidiotus</i> (<i>Chrysomphalus</i>)].		<i>Calostomidia assimilis</i>	39
<i>Cicadula fasciifrons</i>	190, 206	<i>pilosa</i>	39
<i>6-notata</i>	190, 206	<i>Cocpophagus</i> [see <i>Rhizoglyphus</i> (<i>Cocpophagus</i>)].	
Cigarette beetle (see <i>Lasioderma serricorne</i>).		Coffee beetle (see <i>Xyleborus coffeæ</i>).	
<i>Cimbex fagi</i>	40	bean weevil (see <i>Aræcerus fasciculatus</i>).	
<i>variabilis</i>	13, 47, 182, 223	leaf miner (see <i>Leucoptera coffecella</i>).	
Cinnabar moth (see <i>Euchelia jacobæ</i>).		red spider (see <i>Tetranychus bioculatus</i>).	

	Page.		Page.
<i>Colabathristes saccharicida</i>	207	Crucifer leaf beetles (see <i>Phyllotreta</i> spp.).	
<i>Colaspidea metallica</i>	207	<i>Cryphalus abietis</i>	69
<i>Colaspidema atrum</i>	13	<i>boswelliæ</i>	69
<i>Coleophora anatipennella</i>	24, 175	<i>deodara</i>	52
<i>fuseedinella</i>	11	<i>himalayensis</i>	52
<i>laricella</i>	82	<i>intermedius</i>	84
<i>lutipennella</i>	152	<i>longifolia</i>	74
<i>Colobogaster quadridentata</i>	100	<i>major</i>	74
<i>Colopha compressa</i>	95	<i>morinda</i>	81
<i>Conarthrus affinis</i>	33	<i>piceæ</i>	69
<i>jansonii</i>	193	<i>saltuarius</i>	69
<i>Conchaspis angræci</i>	5, 102	<i>strohmeyeri</i>	79
<i>Conchylis epilina</i> (see <i>Phalonia</i>).		<i>Crypsiphona oecurtaria</i>	99
<i>Conchyloctenia punctata</i>	210	<i>Cryptaspidiotus aonidioides</i>	35
Confused flour beetle (see <i>Tribolium confusum</i>).		<i>mediterraneus</i>	139
<i>Coniatus lætus</i>	211	<i>Cryptaspidus nucum</i>	162
<i>suavis</i>	211	<i>Cryptes baccatus</i>	9
Coniferous root weevils (see <i>Brachyrhinus</i>).		<i>Cryptthemichionaspis africana</i>	181
sawfly (see <i>Diprion simile</i>).		<i>Cryptinglisia lounsburyi</i>	130
weevils (see <i>Magdalis</i> spp.).		<i>Cryptoblades aliena</i>	208
<i>Conogethes punctiferalis</i>	166	<i>gnidiella</i>	91, 129, 180
<i>Contarinia gossypii</i>	89	<i>Cryptoecephalus pini</i>	73
<i>pisi</i>	165	<i>Cryptoeocus fagi</i>	39
<i>pyrivora</i>	7, 170	<i>Cryptophaga rubiginosa</i>	11
<i>torquens</i>	49	<i>unipunctata</i>	167, 177, 179
<i>tritici</i>	7, 123	<i>Cryptorhynchus batata</i> (see <i>Euscepes</i>).	
<i>viticola</i>	131	<i>brandisi</i>	74
<i>Coptops bidens</i>	63	<i>gravis</i> (see <i>Sternochetus</i>).	
<i>fusca</i>	63	<i>lapathi</i>	6, 12, 46, 181, 222
<i>Coptosoma cribraria</i>	207	<i>mangiferæ</i> (see <i>Sternochetus</i>).	
<i>Coptotermes gestroi</i>	164	<i>raja</i>	74
<i>Coræbus elatus</i>	153	<i>Crypturgus cinereus</i>	74
<i>fasciatus</i>	153	<i>pusillus</i>	69
<i>undatus</i>	153	<i>Ctenochiton araucariæ</i>	25
Corn fly (see <i>Siphonella pumilionis</i>).		<i>eucalypti</i>	99
Corner spot (see <i>Orgyia gonostigma</i>).		<i>Curculio</i> spp.....	154
<i>Corymbites æneus</i>	43	<i>amoenus</i>	103
<i>Cosmophila sabulifera</i>	155	<i>ceasarum</i>	174
<i>Cosmopolites sordidus</i>	34, 207	<i>elephas</i>	53
<i>Cosmopteryx pallifasciella</i>	208	<i>herbsti</i>	179
<i>Cossus eadambe</i>	212	<i>nueum</i>	133, 134, 154
<i>eossus</i>	12,	<i>rubidus</i>	179
27, 40, 46, 96, 141, 148, 154, 181, 220, 221		Cucurbit fly (see <i>Dacus cucurbitæ</i>).	
<i>tristis</i>	19, 170, 187	ladybird beetles (see <i>Epilachna</i> spp.).	
Cotton blister mite (see <i>Eriophyes gossypii</i>).		Currant fruit moth (see <i>Notocelia roborana</i>).	
boll worm (see <i>Chloridea obsoleta</i>).		gall mite (see <i>Eriophyes ribis</i>).	
flower bud maggot (see <i>Contarinia gossypii</i>).		moth (see <i>Abraxas grossulariata</i>).	
stainers (see <i>Dysdercus</i> spp.).		shoot borer (see <i>Incurvaria capitella</i>).	
stem borer (see <i>Sphenoptera neglecta</i>).		webworm (see <i>Thamnonoma wau-aria</i>).	
worm (<i>Prodenia litura</i>).		worm (see <i>Pteronidea ribesii</i>).	
<i>Cratopus punctum</i>	64	Custard-apple caterpillar (see <i>Anonæpestis bengalella</i>).	
<i>Cratosomus reidi</i>	60	Cutworms.....	8
<i>Crepidodera costatipennis</i>	50	Cutworms (see <i>Agrotis</i> spp.; <i>Euroa</i> spp.; <i>Feltia</i> spp.; <i>Peridroma</i> spp.).	
<i>aurata</i>	181, 221	<i>Cylas brunneus</i>	209
<i>Criocephalus tibetanus</i> (?).....	73	<i>formicarius</i>	6, 209
<i>Crioeris</i> spp.....	27	<i>Cyllo leda</i>	208
<i>asparagi</i>	6, 27	<i>Cymnus tabaci</i>	207, 215
<i>duodecimpunctata</i>	6, 27, 28	Cypress borers (see <i>Diadorus</i> spp.).	
<i>impressa</i>	103	<i>Cyrtopistomus pannosus</i>	212
<i>merdigera</i>	28	<i>Cyrtotrachelus dux</i>	33
<i>Cræsus septentrionalis</i> (see <i>Nematus</i>).		<i>longipes</i>	33
<i>Crossotarsus coniferæ</i>	52, 81	<i>Cytorhynchus frigidus</i>	146
<i>fairmairei</i>	75, 154	<i>Daetylopius eocæus</i>	162
<i>saundersi</i>	194		

	Page.		Page.
<i>Dacus æqualis</i>	58	<i>Diaspis pyri</i>	23, 169
<i>cucurbitæ</i>	38, <u>93</u> , 217	<i>santali</i>	169
<i>curvipennis</i>	34	<i>squamosus</i>	166, 169
<i>diversus</i>	60, <u>117</u> , 132, 147, 167	<i>visci</i>	25, 73, 94, 139
<i>ferrugineus</i>	60, 93, 100, <u>117</u> , 147	<i>zamiæ</i>	5, 162
<i>frenchii</i>	117	<i>Diastrombus politus</i>	206
<i>oleæ</i>	156	<i>Diatræa</i> spp.....	203
<i>ornatissimus</i>	58	<i>canella</i>	203
<i>passifloræ</i>	60, <u>117</u> , 126, 147	<i>lineolata</i>	203
<i>persicæ</i>	<u>117</u> , 147, 167	<i>saccharalis</i>	6, <u>203</u>
<i>psidii</i>	<u>118</u> , 126, 132	<i>striatalis</i>	<u>203</u> , 208
<i>rarotongæ</i>	145	<i>Dichocrocis punctiferalis</i>	24, 34, 51,
<i>tongensis</i>	145	60, <u>85</u> , 94, 126, 132, 142, 167	
(<i>Tephrites</i>) <i>xanthodes</i>	<u>118</u> , 126, 132, 142, 171	<i>Dicranotropis vastatrix</i>	206
<i>Dasychira horsfeldi</i>	194	<i>Dictyophora sinica</i>	190, 206
<i>mendosa</i>	64, 212	<i>Diloba cæruleocephala</i>	<u>21</u> , 179
<i>misana</i>	64, 212	<i>Dindymus versicolor</i>	<u>17</u> , 196
<i>pudibunda</i>	12, 40,	<i>Dinoderus brevis</i>	33
47, 48, <u>107</u> , 132, 134, 137, 141, 148, 154, 192		<i>distinctus</i>	33, 143
<i>selenitica</i>	66	<i>minutus</i>	<u>31</u> , 207
<i>thwaitesi</i>	64, 212	<i>pilifrons</i>	31
<i>Dasyneura abietiperda</i>	81	<i>Dioryctria splendidella</i>	76
<i>brassicæ</i>	<u>49</u> , 188	<i>Diostrombus politus</i>	190
<i>laricis</i>	84	<i>Diparopsis castanea</i>	91
<i>piceæ</i>	81	<i>Diphucephala aurulenta</i>	10
<i>pyri</i>	168	<i>colaspidoides</i>	172
Death's-head moth (see <i>Acherontia atropos</i>).		<i>Diploschema rotundicolle</i>	59
<i>Delphacodes vastatrix</i>	206	<i>Diplosis eucalypti</i>	100
<i>Delphax fumosa</i>	206	<i>paralis</i>	100
<i>furcifera</i>	190, 206	<i>Diprion pallidus</i>	70
<i>graminicola</i>	206	<i>pini</i>	70
<i>propinqua</i>	206	<i>rufus</i>	70
<i>Deltocephalus dorsalis</i>	190, 206	<i>simile</i>	6, 70
<i>Dendroctonus micans</i>	65	<i>Discophora celinde</i>	208
<i>Dendrolimus pini</i>	71	<i>Distichocera macleayi</i>	97
<i>sibiricus</i>	83	<i>Dolopius marginatus</i>	68, 153
<i>Depressaria depressella</i>	164	<i>Dorytomus affinis</i>	222
<i>nervosa</i>	51, 164	<i>agnathus</i>	222
<i>Dermestes frischii</i>	5	<i>dorsalis</i>	222
<i>vulpinus</i>	5	<i>maculatus</i>	222
<i>Desiantha nociva</i>	185, <u>217</u>	<i>majalis</i>	222
<i>Diabrotica graminea</i>	85, 155	<i>Doticus pestilans</i>	24
<i>Diacrisia obliqua</i>	91	<i>Dreata petola</i>	208
<i>Diadorus erythrurus</i>	64, 94	<i>Drepana cultraria</i>	40
<i>scalaris</i>	<u>64</u> , 94	<i>Dreyfusia nuesslini</i>	67
<i>Dialeges pauper</i>	193	<i>piceæ</i>	67
<i>Diamerus fici</i>	103	<i>Drosicha maskelli</i>	102
Diamond-back moth (see <i>Plutella maculipennis</i>).		Drugstore beetle (see <i>Sitodrepa panicea</i>).	
<i>Diaprepes abbreviatus</i>	30,	<i>Dryocætes alni</i>	12
60, 64, 85, 126, 132, 146, 192, <u>200</u>		<i>autocraphus</i>	69
<i>spengleri</i> (see <i>Diaprepes abbrevia-</i>		<i>hewetti</i>	154
<i>tus</i>).		<i>indicus</i>	81
<i>Diapus capillatus</i>	154	<i>minor</i>	193
<i>furtivus</i>	194	<i>villosus</i>	54, 154
<i>impressus</i>	154	<i>Dryophilus pusillus</i>	79, 84
<i>mirus</i>	194	<i>Duomitus ceramicus</i>	212
<i>quinquespinatus</i>	194	Durra stem borer (see <i>Sesamia cretica</i>).	
<i>Diaspidiotus</i> (see <i>Aspidiotus</i> [<i>Diaspidiotus</i>]).		<i>Dysdercus</i> spp.....	86
<i>Diaspis atlantica</i>	139	<i>andreae</i>	86
<i>bromeliæ</i>	102	<i>annuliger</i>	86
<i>cattleyæ</i>	158	<i>cardinalis</i>	86
<i>gennadii</i>	171	<i>cingulatus</i>	<u>86</u> , 87
<i>leperii</i>	132, 166, 220	<i>de-launeyi</i>	86
<i>oleæ</i>	156	<i>fasciatus</i>	86
<i>pentagona</i>	5, 52, 169, 178	<i>fernaldi</i>	86
		<i>howardi</i>	86

	Page.		Page.
<i>Dysdercus insularis</i>	86	<i>Eriococcus coriaceus</i>	99, 131
<i>nigrofasciatus</i>	86	<i>crispus</i>	102
<i>pacificus</i>	86	<i>crofti</i>	99
<i>ruficollis</i>	86	<i>eucalypti</i>	99
<i>sanguinarius</i>	86	<i>fagicroticus</i>	39
<i>sidæ</i>	86	<i>graminis</i>	33
<i>superstitiosus</i>	86	<i>gregarius</i>	99
<i>suturellus</i>	5, 86	<i>irregularis</i>	99
<i>Earias chlorana</i>	91, 223	<i>lagerstræmiæ</i>	102
<i>chromataria</i>	91	<i>onukii</i>	33
<i>fabia</i>	91	<i>pallidus</i>	39
<i>gossypii</i>	91	<i>picta</i>	99
<i>insulana</i>	87	<i>raithbyi</i>	39
<i>plaga</i>	91	<i>serratilobis</i>	99
Early moth (see <i>Hibernia rupicapraria</i>).		<i>simplex</i>	99
East African cotton weevil (see <i>Apion xanthostylum</i>).		<i>spiniger</i>	99
<i>Echinocnemis squameus</i>	191, 207	<i>tepperi</i>	99
<i>Ecthæa quadricornis</i>	50	<i>tesselatus</i>	99
Eggplant fruit borer (see <i>Leucinodes orbonalis</i>).		<i>Eriogaster lanestris</i>	46, 141, 154, 181, 223
Egyptian cotton boll worm (see <i>Earias insulana</i>).		<i>Eriophyes</i> spp.....	172
cotton worm (see <i>Prodenia litura</i>).		<i>avellanæ</i>	133
Eight-toothed large spruce bark beetle (see <i>Ips typographus</i>).		<i>fraxini</i>	26
<i>Elaphodes tigrinus</i>	10	<i>goniothorax</i>	132
<i>Elimæa chloris</i>	205	<i>gossypii</i>	86
Elm bark beetle (see <i>Scolytus multistriatus</i>).		<i>lævis</i>	11
leaf beetle (see <i>Galerucella luteola</i>).		<i>laricis</i>	82
sawfly (see <i>Fenusa dohrnii</i>).		<i>macrochelus</i>	147
<i>Enarmonia pinicolana</i>	67, 70	<i>oleivorus</i>	5, 55
<i>rufimitrana</i>	77, 78	<i>padi</i>	5, 172
<i>Entochira lateralis</i>	198, 216	<i>phlæocoptes</i>	5, 172
<i>Entodecta pumila</i>	47	<i>pini</i>	70
<i>Epacromia tamulus</i>	205	<i>psilaspis</i>	223
<i>Epepeotes luscus</i>	50, 146	<i>pyri</i>	5
<i>Ephestia cautella</i>	6, 163	<i>quadrisetus</i>	139
<i>elutella</i>	76	<i>ribis</i>	118, 119
<i>kuehniella</i>	6	<i>rudis</i>	45
<i>Epiblema nigricana</i> (see <i>Eucosoma</i>).		<i>similis</i>	172
<i>tedella</i> (see <i>Laspeyresia</i>).		<i>tetanolthrix</i>	222
<i>Epicauta rufidorsum</i>	43, 184	<i>tiliæ</i>	141
<i>sibirica</i>	184	<i>tiliarius</i>	141
<i>Epicoccus acaciæ</i>	9	<i>vermiformis</i>	133
<i>Epidiaspis piricola</i>	5, 23, 24, 121, 166, 169	<i>vitis</i>	5, 127
<i>Epilachna</i> spp.....	92, 183	<i>Eriosoma lanuginosa</i>	95
<i>argus</i>	92	<i>ulmi</i>	95
<i>chrysomelina</i>	92	<i>Ernobius abietinus</i>	73
<i>dodecastigma</i>	92, 183	<i>abietis</i>	79
<i>guttato-pustulata</i>	183	<i>angusticollis</i>	79
<i>28-maculata</i>	183	<i>longicornis</i>	79
<i>28-punctata</i>	92, 183	<i>nigrinus</i>	73
<i>phyto</i>	183	<i>pini</i>	73
<i>pusillanina</i>	183	<i>Ernoporos caucasicus</i>	141
<i>territa</i>	183	<i>fagi</i>	40
<i>Episomus albinus</i>	207	<i>tiliæ</i>	141
<i>Ereunetis flavistriata</i>	34, 163, 171, 204, 208	<i>Estigmaena chinensis</i>	33
<i>muiriella</i>	208	<i>Etiella zinckenella</i>	165
<i>pilosata</i>	208	<i>Eubactrus</i> sp.....	73
<i>Eriocampoides limacina</i>	6	<i>Eucalymnatus brunfelsiæ</i>	35
<i>Eriococcus aceris</i>	39, 147, 153	<i>Eucanthus semiglaucæ</i>	206
<i>angulatus</i>	25	<i>Euchelia jacobæ</i>	185
<i>araucariæ</i>	25	<i>Euchirus macleayi</i>	153
<i>buxi</i>	48	<i>Euchloris submissaria</i>	10
<i>confusus</i>	99	<i>Eucosoma nigricana</i>	77
		<i>paragramma</i>	32
		<i>schistacea</i>	208
		<i>Eudamus proteus</i>	38
		<i>Eumerus strigatus</i>	139, 157

	Page.		Page.
<i>Eumetopina krugeri</i>	206	Forest defoliators (see <i>Melolontha melolontha</i>).	
<i>Euphilippia olivina</i>	156	<i>Frea maculicornis</i>	63
<i>Euplexis nigerrima</i>	185	<i>marmorata</i>	63
<i>Euproctis chrysorrhæa</i>	6,	Frit fly (see <i>Chlorops lineata</i> ; <i>Oscinis frit</i>).	
40, <u>107</u> , 132, 137, 148, 154, 181, 192, 223		Fruit tree bark beetle (see <i>Scolytus rugulosus</i>).	
<i>divisa</i>	212	borer (see <i>Capnodis tenebrionis</i>).	
<i>flavata</i>	208	<i>Furcaspis oceanica</i>	158, 162
<i>flexuosa</i>	55	<i>Galerucella luteola</i>	6
<i>latifascia</i>	212	<i>tenella</i>	197
<i>minor</i>	208	<i>Gallobellicus crassicornis</i>	215
<i>Eupteryx solani</i>	184	<i>Gasterocercodes gossypii</i>	91
European grain moth (see <i>Tinea granella</i>).		<i>Gastropacha quercifolia</i>	24, <u>111</u> , 132, 170, 179, 223
thrips (see <i>Haplothrips tritici</i>).		<i>Gastrophora henricaria</i>	99
hop flea-beetle (see <i>Psylliodes attenuata</i>).		<i>Gazalina apsara</i>	154
pine-shoot moth (see <i>Evetria buoliana</i>).		<i>Gelastorhinus esox</i>	205
<i>Euscepes batatæ</i>	209	<i>Gelechia atriplicella</i>	41
<i>Euura ater</i>	223	<i>dodecella</i>	70
<i>Euxoa radians</i>	185	<i>gossypiella</i> (see <i>Pectinophora</i>).	
<i>segetis</i>	91	<i>instabilella</i>	41
<i>spinifera</i>	216	<i>ocellatella</i>	<u>41</u> , 42
<i>Euzophera cedrella</i>	52, 70	<i>Gelonætha hirta</i>	212
<i>Evaspidiotus</i> [see <i>Aspidiotus</i> (<i>Evaspidiotus</i>)].		<i>Geococcus radicum</i>	146
<i>Evergestis extimalis</i>	49, 87, <u>188</u>	<i>Geoica lucifuga</i>	207
<i>Evetria</i> spp.....	72	<i>Geonomus quadrinodosus</i>	64
<i>buoliana</i>	6, 70, <u>72</u>	Giant sugar cane borer (see <i>Castnia licus</i>).	
<i>comstockiana</i>	72	Giffard fruit fly (see <i>Ceratitis giffardi</i>).	
<i>duplana</i>	6, <u>72</u>	white fly (see <i>Bemisia giffardi</i>).	
<i>frustrana</i>	72	Gipsy moth (see <i>Porthetria dispar</i>).	
<i>pinivorana</i>	6, <u>72</u>	<i>Glenea novemguttata</i>	50
<i>resinella</i>	72	<i>Glyphina betulæ</i>	45
<i>rigidana</i>	72	<i>Gnathodus pallidulus</i>	206
<i>turionana</i>	6, <u>72</u>	<i>viridis</i>	206
Feathery-horned yellow-box borer (see <i>Distichocera macleayi</i>).		<i>Gnorimoschema heliopa</i>	215
<i>Feltia</i> sp.....	6	Goat moth (see <i>Cossus cossus</i>).	
<i>Fenusa dohrnii</i>	6	<i>Gonocephalum intermedium</i>	216
Fig branch borer (see <i>Hylesinus porcatus</i>).		<i>Gonocephalum</i> (<i>Opatrum</i>) <i>acutangulum</i>	207, 216
moth (see <i>Ephestia cautella</i>).		<i>pusillum</i>	216
stem-boring beetle (see <i>Sinoxylon sudanicum</i>).		<i>sabulosum</i>	43, 73
tree borer (see <i>Batocera boisduvali</i>).		Gooseberry moth (see <i>Zophodia convolutella</i>).	
Figure-of-8-moth (see <i>Diloba cæruleocephala</i>).		<i>Gortyna flavago</i>	185
Fiji fly (see <i>Dascus passifloræ</i>).		<i>ochracea</i>	185
<i>Filippia oleæ</i>	156	<i>Gossyparia cavellii</i>	39
<i>Fiorinia acaciæ</i>	9	<i>spuria</i>	96
<i>bambusæ</i>	32	<i>Gracillaria syringella</i>	27
<i>diaspiiformis</i>	32	Grain fly (see <i>Camarota flavitarsis</i>).	
<i>grossulariæ</i>	121	Grape anomala (see <i>Anomala vitis</i>).	
<i>signata</i>	32	blister mite (see <i>Eriophyes vitis</i>).	
<i>stricta</i>	158	borers (see <i>Vesperus</i> spp.).	
<i>tenuis</i>	32	gun worm (see <i>Sciopteron regale</i>).	
<i>thex</i>	156, 212	pyralid (see <i>Polychrosis botrana</i>).	
Fir bark tortricid (see <i>Laspeyresia duplicana</i>).		root weevils (see <i>Brachyrhinus</i> spp.).	
bud worm (see <i>Eucosoma nigricana</i>).		worm (see <i>Bromius</i> spp.).	
Flatheaded leaf-miner beetle (see <i>Aphanistichus consanguineus</i>).		vine flatheaded borer (see <i>Sinoxylon</i> spp.).	
wood borer (see <i>Agilus viridis</i>).		worm (see <i>Clysia ambiguella</i>).	
Flax capsule worm (see <i>Phalonia epilina</i>).		<i>Grapholitha</i> (see <i>Laspeyresia</i> spp.).	
Flea beetle (see <i>Phyllotreta atra</i>).		Grass army worm (see <i>Spodoptera mauritia</i>).	
Flour beetles.....	122	Gray borer of the sugar cane (see <i>Laspeyresia schistaceana</i>).	
Fluted scale (see <i>Icerya purchasi</i>).		fruit tree bud moth (see <i>Olethreutes cynobatella</i>).	
<i>Fonscolombia fraxini</i>	26	larch moth (see <i>Enarmonia pinicolana</i>).	
		plum owlet moth (see <i>Xylina ornithopus</i>).	
		Greasy cutworm (see <i>Agrotis ypsilon</i>).	
		Great oak borer (see <i>Cerambyx cerdo</i>).	

	Page.		Page.
Greedy scale (see <i>Aspidiotus camelliae</i>).		<i>Heterusia cingala</i>	212
Green hanging moth of the apple (see <i>Charagia lignivora</i>).		<i>Hibernia aurantiaria</i>	40, 46, 132, 141, 154, 181
leaf weevil (see <i>Phyllobius maculicornis</i>).		<i>defoliaria</i>	24, 40,
pug moth (see <i>Chloroclystis rectangulata</i>).		46, 96, <u>106</u> , 132, 137, 141, 149, 154, 181, 192	
oak tortrix (see <i>Tortrix viridana</i>).		<i>marginaria</i>	40, 46, 132, 137, 141, 154, 181
<i>Gryllotalpa africana</i>	89, 190, 205, 215	<i>rupicaprararia</i>	<u>111</u> , 179
<i>gryllotalpa</i>	43, 45, 215	<i>Hieroglyphus banian</i>	190
<i>vulgaris</i> (see <i>Gryllotalpa gryllotalpa</i>).		<i>Himatium asperum</i>	193
<i>Gryllus melas</i>	43	<i>Hispa ænescens</i>	190
<i>mitratus</i>	205	<i>callicantha</i>	190, 207
<i>Gueriniella serratulæ</i>	73, 94, 96, 130, 150	<i>wakkeri</i>	199
Gum tree bug (see <i>Mictis profana</i>).		<i>Holaniara picescens</i> (see <i>Entochira lateralis</i>).	
<i>Gunda sikkima</i>	103	<i>Holotrichia leucophthalma</i>	207
Gypsy moth (see <i>Porthetria dispar</i>).		<i>vidua</i>	207
<i>Hadena secalis</i>	123	<i>Holzneria poschingeri</i> (see <i>Prociphilus bumelie</i>).	
<i>Halimococcus lampas</i>	162	Hop aphid (see <i>Phorodon humuli</i>).	
<i>Haltica ampelophaga</i>	<u>128</u> , 222	leaf miner (see <i>Agromyza frontalis</i>).	
<i>quercetorum</i>	12, 39, 46, 134, <u>151</u> , 192, 222	midge (see <i>Cecidomyia humuli</i>).	
<i>Haplothrips aculeata</i>	125	root borer (see <i>Hepialus humuli</i>).	
<i>tritici</i>	125	<i>Hoplacampa fulvicornis</i>	24, <u>177</u> , 178
Harlequin fruit bug (see <i>Dindymus versicolor</i>).		<i>rutilicornis</i>	180
<i>Harpalus æneus</i>	81	<i>testudinea</i>	22, <u>23</u>
<i>ruficornis</i>	196	<i>Hoplocerambyx spinicornis</i>	193
Hawaiian beet webworm (see <i>Hymenia fascialis</i>).		<i>Hormomyia annulipes</i>	40
leaf bug (see <i>Hyalopeplus pellucidus</i>).		<i>fagi</i>	40
sugar-cane borer (see <i>Rhabdocnemis obscurus</i>).		Hornet moths (see <i>Trochilium</i> spp.).	
sugar-cane leafroller (see <i>Omiodes accepta</i>).		Horse-chestnut borer (see <i>Zeuzera pyrina</i>).	
Hawthorne scale (see <i>Lecanium bituberculatum</i>).		<i>Hyalopeplus pellucidus</i>	37
Hazelnut blister mites (see <i>Eriophyes avellanae</i> ; <i>Eriophyes vermiformis</i>).		<i>Hydrellia griseola</i>	125
<i>Hedotettix arcuatus</i>	205	<i>Hydræcia micacea</i>	185
<i>Heilipus bonelli</i>	191	<i>Hylastes angustatus</i>	74
<i>lauri</i>	30	<i>ater</i>	74
<i>Heliothrips rubrocinctus</i>	5, 50,	<i>attenuatus</i>	69
63, <u>109</u> , 132, 140, 146, 192, 218		<i>cunicularius</i>	81
<i>striatoptera</i>	207	<i>decumanus</i>	69
<i>Hellula undalis</i>	6, 186	<i>himalayensis</i>	69
<i>Helopeltis antonii</i>	50	<i>longifolia</i>	74
<i>theivora</i>	50	<i>opicus</i>	74
<i>Hemiberlesia</i> (see <i>Aspidiotus</i> [<i>Hemiberlesia</i>]).		<i>Hylecætus dermestoides</i>	39, 46, 79, 148, 153
<i>Hemichionaspis</i> sp.....	11	<i>Hylemyia antiqua</i>	157
<i>fici</i>	102	<i>coarctata</i>	124
<i>minima</i>	102	<i>Hylesinus crenatus</i>	27, 154
<i>scrobicularum</i>	32	<i>fraxini</i>	27, 157
<i>Hemirhopala atrilineata</i>	150	<i>oleæ</i>	157
<i>Hepialus humuli</i>	85, <u>135</u> , 185, 188	<i>oleiperda</i>	27
<i>lupulinus</i>	185	<i>porcatus</i>	101
<i>Herse convolvuli</i>	210	<i>vestitus</i>	157
<i>Hesperia conjuncta</i>	208	<i>Hylobius abietis</i>	12, 40, 46, 68
<i>philino</i>	208	<i>fatuus</i>	68
Hessian fly (see <i>Phytophaga destructor</i>).		<i>piceus</i>	68
<i>Heterachthes æneolus</i>	131	<i>Hylotrupes bajulus</i>	68
<i>Heterobostrichus æqualis</i>	193, 194	<i>Hylurgops glabratus</i>	81
<i>pilcatus</i>	193	<i>pulliatus</i>	69
<i>unicornis</i>	33	<i>Hylurgus ligniperda</i>	74
<i>Heteroplia varians</i>	193	<i>Hymenia fascialis</i>	6, <u>42</u> , 43
<i>Heterorhina hookeri</i>	10	<i>Hypena rostralis</i>	137
		<i>Hypera</i> spp.....	<u>61</u> , <u>184</u>
		<i>crinita</i>	184
		<i>fasciculata</i>	51
		<i>meles</i>	6, <u>14</u> , <u>61</u>
		<i>miles</i>	61
		<i>murina</i>	<u>13</u> , <u>61</u>
		<i>nigrirostris</i>	6, <u>61</u> , 158
		<i>ononidis</i>	<u>61</u> , 158
		<i>pastinacæ tigrina</i>	51

	Page.		Page.
<i>Hypera postica</i>	6, 14, 15	Juniper blister mite (see <i>Eriophyes quadri-</i>	
<i>punctata</i>	6, 14, 51, 61	<i>setus</i>).	
<i>rogenhoferi</i>	51	<i>Kakivoria flavofasciata</i>	170
<i>rumicis</i>	189	<i>Kermes acacix</i>	9
<i>variabilis</i>	38, 47, 61, 184, 185	<i>bacciformis</i>	153
<i>Hypoborus ficus</i>	103	<i>ballotæ</i>	153
<i>Hypæschrus indicus</i>	193	<i>cordiformis</i>	153
<i>Hypomeces curtus</i>	63	<i>gibbosus</i>	153
<i>unicolor</i>	191, 207	<i>ilicis</i>	153
<i>Hyponomeuta evonymella</i>	48	<i>pallidus</i>	153
<i>malinellus</i>	21, 180	<i>roboris</i>	153
<i>padellus</i>	21, 180	<i>vermilio</i>	153
<i>padi</i>	48	<i>Kirbya pagana</i>	206
<i>Hysipyla robusta</i>	142, 218	<i>Kuwania parva</i>	178
<i>Icerya ægyptiæa</i>	102	<i>Lachnosterna</i> (see <i>Phyllophaga</i>).	
<i>albolutca</i>	94	<i>Lachnus agilis</i>	72
<i>maxima</i>	102	<i>fasciatus</i>	81
<i>minor</i>	145	<i>grossus</i>	78, 81
<i>montserratensis</i>	30, 35, 59, 131, 162, 192	<i>laricis</i>	84
<i>palmeri</i>	102, 130	<i>nudus</i>	72
<i>purchasi</i>	5	<i>piecæ</i>	78, 81
<i>seychellarum</i>	59, 102, 131, 146, 162, 192, 206	<i>pichtæ</i>	78
Imported cabbage butterfly (see <i>Pontia rapæ</i>)		<i>pini</i>	72
maggot [see <i>Chortophila</i>		<i>pinicola</i>	81
(<i>Pegomya</i>) <i>brassicæ</i>].		<i>tæniatus</i>	72
clover weevil (see <i>Miceotrogus pici-</i>		<i>tomentosus</i>	72
<i>rostris</i>).		<i>viminalis</i>	222
onion maggot (see <i>Pegomya cepe-</i>		Lackey moth (see <i>Malacosoma neustria</i>).	
<i>torum</i>).		<i>Lacon</i> sp. near <i>dauidi</i>	81
<i>Ina ampelophaga</i>	131	<i>murinus</i>	43, 153, 184
<i>Incurvaria capitella</i>	121	- <i>shirakii</i>	207
Indian meal moth (see <i>Plodia interpunctella</i>).		<i>Lælia costalis</i>	208
tea geometrid (see <i>Biston suppres-</i>		<i>subrufa</i>	208
<i>sarius</i>).		<i>Læmophlæus testaceus</i>	193
<i>Inesida leprosa</i>	163	<i>Læmotmetus rhizophagoides</i>	190
<i>Inglisia conchiformis</i>	131	<i>Lagosinia strachani</i>	94
<i>fagi</i>	39	<i>Lamia textor</i>	181, 222
<i>Ips acuminatus</i>	74	<i>Lampra assamensis</i>	103
<i>amitinus</i>	69	<i>decepiens</i>	96
<i>blandfordi</i>	74	<i>ruilans</i>	12, 96, 141
<i>cembræ</i>	69	<i>undatus</i>	141
<i>duplicatus</i>	69	<i>Laphygma exigua</i> (<i>Caradrina</i>).....	6, 14, 210
<i>longifolia</i>	74	<i>reclusa</i>	210, 216
<i>mannsfeldi</i>	74	Lappet moth (see <i>Gastropacha quercifolia</i>).	
<i>ribbentropi</i>	69	Larch blister mite (see <i>Eriophyes laricis</i>).	
<i>-sexdentatus</i>	69	bud-gall midge (see <i>Dasyneura laricis</i>).	
<i>stebbingi</i>	52	gall moth (see <i>Laspeyresia zebeana</i>).	
<i>typographus</i>	66, 69	needle miner (see <i>Coleophora laricella</i>).	
Island fruit fly (see <i>Rioxa musæ</i>).		sawfly (see <i>Nematus erichsoni</i>).	
<i>Isosoma noxiale</i>	126	shoot moth (see <i>Argyresthia læviga-</i>	
<i>Itycorsia campestris</i>	77	<i>tella</i>).	
<i>stellata</i>	70	spinner (see <i>Dendrolimus sibiricus</i>).	
<i>Janus compressus</i>	169	tussock moth (see <i>Dasychira selenitica</i>).	
<i>cynosbati</i>	154	<i>Larentia dilutata</i>	12, 40, 46, 96, 154, 223
<i>fumipennis</i>	47	<i>nebulata</i>	46
<i>luteipes</i>	192	Large Australian fruit fly (see <i>Dæus æqualis</i>).	
Japanese grain moth (see <i>Melissoblaptes</i>		bast beetle (see <i>Dendroctonus micans</i>).	
<i>gularis</i>).		pith borer [see <i>Tomicus</i> (<i>Myelophilus</i>)	
rose beetle (see <i>Adoretus umbrosus</i>).		<i>piniperda</i>].	
<i>Jassus sernotatus</i>	125	pear psylla (see <i>Psylla pyrisuga</i>).	
Java cinchona geometrid (see <i>Boarmia</i>		<i>Lasiocampa quercus</i>	75, 154
<i>crepuscularia</i>).		<i>trifolii</i>	60
sugarcane grub beetle (see <i>Apogonia</i>		<i>Lasioderma serricorne</i>	6
spp.).		<i>Lasioptera cerealis</i>	124
June beetle (see <i>Melolontha</i> spp.).		<i>miscella</i>	100

	Page.		Page.
<i>Laspeyresia</i> spp.....	165	<i>Lepidiota bimaculata</i>	193
<i>amplana</i>	134, 220	<i>Lepidosaphes abietis</i>	79
<i>coniferana</i>	79	<i>acaciæ</i>	9
<i>dorsana</i>	165	<i>bambusicola</i>	32
<i>duplicana</i>	67, 140	<i>beckii</i>	5
<i>funebrana</i>	176	<i>cocculi</i>	158
<i>glycinivorella</i>	196	<i>corrugata</i>	63
<i>grossana</i>	38, 54, 134, 154, 196, 220	<i>duponti</i>	162
<i>nebritana</i>	165, 196	<i>ficifolii</i>	102
<i>nigricana</i>	6, 165	<i>ficus</i>	5
<i>pactolana</i>	79, 80	<i>juniperi</i>	139
<i>pomonella</i>	6	<i>longula</i>	30
<i>proximana</i>	79	<i>mcgregori</i>	162
<i>prunivorana</i>	179	<i>mexicana</i>	102
<i>schistaceana</i>	204	<i>minima</i>	102
<i>splendana</i>	53, 54, 154, 220	<i>newsteadi</i>	73
<i>strobilella</i>	80	<i>olivina</i>	156
<i>tedella</i>	80, 81	<i>pallida</i>	158
<i>wæberiana</i>	176	<i>pinnæformis</i>	59
<i>zebeana</i>	83	<i>somalensis</i>	9
<i>Latheticus oryzae</i>	122	<i>spinifera</i>	9
Leaf hispa (see <i>Brontispa froggatti</i>).		<i>ulmi</i>	5
Leather beetle (see <i>Dermestes</i> spp.).		<i>unicolor</i>	162
<i>Lecaniodiaspis acaciæ</i>	9	<i>Leptocorisa varicornis</i>	190, 207
<i>africana</i>	9, 102	<i>Leptodictya tabida</i>	207
<i>convexus</i>	98	<i>Leptoglossus</i> spp.....	97
<i>dilatata</i>	9	<i>Leptops hopei</i>	17, 18, 170, 179
<i>frenchi</i>	98	<i>tribulus</i>	10
<i>newmanni</i>	98	<i>Leptostylus præmorsus</i>	56
<i>sardoa</i>	192	<i>Leptura rubriola</i>	81
<i>Lecanium aceris</i>	147	Lesser grain borer (see <i>Rhizopertha dominica</i>).	
<i>arion</i>	25	<i>Leucania loreyi</i>	208
<i>bituberculatum</i>	5, 23, 132, 169	<i>unipuncta</i> (see <i>Cirphis</i>).	
<i>capreæ</i>	11, 23, 169	<i>Leucaspis bambusæ</i>	32
<i>catori</i>	140	<i>indica</i>	5, 146
<i>caudatus</i>	63	<i>japonica</i>	5, 23, 32, 192
<i>cerasi</i>	178	<i>læwi</i>	73
<i>cerasorum</i>	178	<i>pini</i>	73
<i>ciliatum</i>	45, 48, 153, 181, 222	<i>pistaciæ</i>	171
<i>corni</i>	11	<i>pusilla</i>	73
<i>coryli</i>	11, 24, 45, 95, 96, 121, 132, 134, 137, 138, 141, 147, 153, 169, 178, 181, 186, 220, 222	<i>riccæ</i>	156
<i>glandi</i>	23, 169	<i>signoreti</i>	73
<i>guerinii</i>	206	<i>Leucinodes orbonalis</i>	95
<i>krugeri</i>	206	<i>Leucodiaspis cockerelli</i>	44, 162
<i>kunoensis</i>	24, 166, 169	<i>Leucoma diaphana</i>	194
<i>perornatum</i>	191	<i>Leucophlebia lineata</i>	208
<i>persicæ</i>	23, 130, 166, 186	<i>Leucoptera coffeella</i>	62
<i>prunastri</i>	24, 179	<i>Leucotermes lucifugus</i>	7
<i>pseudexpansum</i>	162	<i>Levuana iridescens</i>	159, 163
<i>pulchrum</i>	45, 53, 134, 137, 153, 191	Liberian sweet-potato borer (see <i>Cylas brun-</i> <i>neus</i>).	
<i>pyri</i>	23	<i>Lichtensia catoni</i>	156
<i>rehi</i>	121	<i>lutea</i>	102
<i>rubi</i>	121	<i>viburni</i>	219
<i>rugosum</i>	23, 166, 169, 179, 186	Light-brown apple moth (see <i>Tortrix ash-</i> <i>worthana</i>).	
<i>sericeum</i>	79	<i>Ligyrrus rugiceps</i>	207
<i>tiliæ</i>	169	<i>Limnophilus flavicornis</i>	220
<i>variegatum</i>	23	<i>Limothrips denticornis</i>	125
<i>vini</i>	23, 24, 130, 166, 169	<i>Limoniæ æruginosus</i>	153
<i>Leiomerus granicollis</i>	51	<i>Lincodes ochracea</i>	185
<i>Lema cyanella</i>	122	<i>Liogryllus bimaculatus</i>	205
<i>flavipes</i>	191	<i>formosanus</i>	205
<i>melanopus</i>	122	<i>Liopus nebulosus</i>	23, 25, 169, 179
Lemon caterpillar (see <i>Papilio demoleus</i>).		<i>Liparus coronatus</i>	44, 51
silver mite (see <i>Eriophyes oleivorus</i>).			

	Page.		Page.
<i>Litæ</i> (see <i>Gelechiæ</i>).		Mango shoot psylla (see <i>Psylla cistellatæ</i>).	
Little bollworm (see <i>Pyroderces simplex</i>).		weevil (see <i>Sternochetus mangiferæ</i>).	
<i>Lixus ascanii</i>	44	March moth (see <i>Anisopteryx æscularia</i>).	
<i>vetula</i>	207	<i>Margarodes formicærum</i>	206
<i>Lochmæa capreæ</i>	46	Marguerite fly (see <i>Phytomyza affinis</i>).	
<i>Locusta viridissima</i>	215	<i>Maruca testulalis</i>	37
<i>Lonchæa splendida</i>	95, 185, 217	<i>Massicus unicolor</i>	153
Longheaded flour beetle (see <i>Latheticus ory-</i>		Masters' gum borer (see <i>Trypocharia mas-</i>	
<i>zæ</i>).		<i>tersi</i>).	
<i>Lophocateres (Ostoma) pusillus</i>	122	Mauritius fruit fly (see <i>Ceratitis catoirei</i>).	
<i>Lophodes sinistraria</i>	10, 25	<i>Mayetiola avenæ</i>	124
<i>Lophosternus hugeli</i>	153	<i>destructor</i> (see <i>Phytophaga</i>).	
Lucern moth of New South Wales (see <i>Tortrix</i>		<i>Mecopoda elongatæ</i>	205
<i>divulsana</i>).		Mediterranean flour moth (see <i>Ephestia kuch-</i>	
<i>Ludius suturalis</i>	207	<i>niella</i>).	
<i>Luperus pinicola</i>	73	fruit fly (see <i>Ceratitis capitata</i>).	
<i>Lycæna bætica</i>	37	<i>Megastigmus brevicaudus</i>	149
<i>Lycetus brunneus</i>	188	<i>borricsi</i>	79
<i>linearis</i>	153	<i>strobilobius</i>	70
<i>spinifrons</i>	33, 218	<i>Meges marmoratus</i>	153
<i>Lygæonematus ambiguus</i>	82	<i>Melanimon tibiale</i>	73
<i>pini</i>	82	<i>Melanitis leda</i>	208
<i>saxreseni</i>	82	<i>Melanophila picta</i>	181
<i>Lygesis mendica</i>	10	<i>Melasoma æneæ</i>	12, 46
<i>Lygus oryzæ</i>	190, 207	<i>populi</i>	222
<i>pratensis</i>	5	<i>Meligethes æneus</i>	188, 218
<i>sacchari</i>	207	<i>Melissoblaptes gularis</i>	191
<i>Lymantria brittata</i>	194	<i>Melobasis splendida</i>	10
<i>grandis</i>	194	<i>Melolontha castanipes</i>	215
<i>lipcha</i>	194	<i>hippocastani</i>	10, 12, 26, 39, 46, 54, 73,
<i>monacha</i>	40, 47, 48, 70,	96, 137, 138, 141, 148, 149, 153, 171, 181, 222	
108, 134, 137, 141, 148, 149, 154, 181, 223		<i>melolontha</i>	10, 12, 26, 39, 46, 54, 73, 96,
<i>Lymexylon navale</i>	153	104, 137, 138, 141, 148, 149, 153, 171, 181, 222	
<i>Lytta vesicatoria</i>	26	<i>niger</i>	215
<i>Machærota planitia</i>	90	<i>rufipes</i>	215
<i>Macrophya punctum-album</i>	27, 133, 154	<i>tenebrosus</i>	215
<i>Macrosiphum fragariæ</i>	196	<i>vulgaris</i>	43, 104, 215
<i>fragariellum</i>	196	Melon aphid (see <i>Aphis gossypii</i>).	
<i>pisi</i>	5, 165	fruit fly (see <i>Carpomyia pardalina</i>).	
<i>rogersii</i>	196	weevil (see <i>Baris trægardhi</i>).	
<i>Macrothylacia rubi</i>	47	<i>Menida histrio</i>	207
<i>Magdalis</i> spp.....	65	<i>Merodon clavipes</i>	150
<i>armigera</i>	173	<i>equestris</i>	150
<i>aterrima</i>	96	<i>Mesites aquitanus</i>	74
<i>barbicornis</i>	17, 132, 149, 187	Metallic tomato fly (see <i>Lonchæa splendida</i>).	
<i>carbonaria</i>	45, 134, 179, 220	<i>Metallites atomarius</i>	68
<i>cerasi</i>	23, 132, 170, 179	<i>iris</i>	46, 154
<i>duplicata</i>	65	<i>laricis</i>	68
<i>memnonia</i>	65	<i>mollis</i>	68
<i>phlegmatica</i>	65	<i>Metamasius hemipterus</i>	200
<i>pruni</i>	23, 132, 179, 187	<i>ritchiei</i>	171
<i>rufa</i>	65	<i>sericeus</i>	200
<i>violacea</i>	65	<i>Metanastria hyrtaca</i>	55
Magpie moth (see <i>Abraxas grossulariata</i>).		Mexican bean weevil (see <i>Spermophagus pec-</i>	
<i>Malacosoma neustria</i>	40, 46, 106, 154, 181, 192, 223	<i>toralis</i>).	
<i>Mamestra albicollis</i>	216	fruit fly (see <i>Anastrepha ludens</i>).	
<i>brassicæ</i>	44, 50, 141, 216	grain beetle (see <i>Pharaxontha kir-</i>	
<i>dissimilis</i>	44	<i>schi</i>).	
<i>oleracea</i>	29, 44, 50	<i>Miccotrogus picirostris</i>	61
Mandarin fruit fly (see <i>Dacus ornatissimus</i>).		<i>Micromima olivia</i>	95, 216, 217
Mango bark borer (see <i>Plocæderus ruficornis</i>).		<i>Mictis profana</i>	97
borer (see <i>Batocera titana</i> ; <i>Dinoderus</i>		Millet stalk worm (see <i>Pyrausta nubilalis</i>).	
<i>distinctus</i>).		<i>Mindarus abietinus</i>	67
fruit fly (see <i>Dacus ferrugineus</i>).		Mites (see <i>Acarina</i>).	
scale (see <i>Coccus mangiferæ</i> ; <i>Leucaspis</i>		<i>Mnesampela privata</i>	99
<i>indica</i>).		<i>Moecha adusta</i>	50, 195

	Page.		Page.
<i>Moecha büttneri</i>	63	Northern mango weevil (see <i>Sternochetus gra-</i>	
<i>molator</i>	63	<i>vis</i>).	
<i>Mogannia hebes</i>	207	peach moth (see <i>Conogethes puncti-</i>	
Mole crickets (see <i>Gryllotalpa</i> spp.; <i>Schizodac-</i>		<i>feralis</i>).	
<i>tylus</i> spp.).		<i>Nothorhina muricata</i>	73
<i>Molorchus minor</i>	79	<i>Notocelia roborana</i>	47, 121, 154, 192
<i>Monarthropalpus burii</i>	48	Nun moth (see <i>Lymantria monacha</i>).	
<i>Monoctenus juniperi</i>	134	Nut fruit tortrix (see <i>Laspeyresia splendana</i>).	
<i>Monohammus fistulator</i>	50, 63	tortrix (see <i>Laspeyresia amplana</i>).	
<i>galloprovincialis</i>	73	weevil (see <i>Curculio nucum</i>).	
<i>ruspator</i>	50	<i>Nymphula depunctalis</i>	191
<i>sartor</i>	68	<i>fluctuosalis</i>	191
<i>Monolepta nigrobilineata</i>	207	<i>Nysius minor</i>	215
<i>Monophlebus stebbingi octocaudata</i>	102	<i>vinitor</i>	109, 125, 130, 166, 179
Moon-fleeked moth (see <i>Phalera bucephala</i>).		Oak bud moth (see <i>Coleophora lutipennella</i>).	
spot moth (see <i>Phalera bucephala</i>).		flea beetle (see <i>Haltica quercetorum</i>).	
Morganella [see <i>Aspidiotus</i> (<i>Morganella</i>)].		procession moth (see <i>Cnethocampa pro-</i>	
Mottled umber moth (see <i>Hibernia defoliaria</i>).		<i>cessiona</i>).	
<i>Mudaria cornifrons</i>	194	scales (see <i>Astrolecanium variolosum</i>).	
<i>Mycalesis mineus</i>	208	Oat gall midge (see <i>Mayetiola avenæ</i>).	
<i>Myelophilus</i> [see <i>Tomicus</i> (<i>Myelophilus</i>)].		<i>Oberea linearis</i>	12, 96, 133, 134, 220
<i>Mylocerus acaciæ</i>	10	<i>oculata</i>	222
<i>brunneus</i>	207	Oblong leaf weevil (see <i>Phyllobius oblongus</i>).	
<i>carinirostris</i>	212	<i>Ochsenheimeria taurella</i>	123
<i>discolor variegatus</i>	212	<i>Ocinara dilectula</i>	103
<i>guttulus</i>	207	<i>lewinii</i>	99
<i>viridanus</i>	212	<i>signifera</i>	103
<i>Mylabris</i> sp.....	6, 35	<i>Ocneria detrita</i>	154
<i>affinis</i>	36	<i>Ocnerostoma piniariella</i>	76
<i>atomarius</i>	36	<i>Ocrophara montana</i>	33
<i>lentis</i>	6, 36, 165	<i>Odonaspis</i> [see <i>Aspidiotus</i> (<i>Odonaspis</i>)].	
<i>loti</i>	36	<i>Odonestis australasiæ</i>	24, 100
<i>pallidicornis</i>	36, 165	<i>plagifera</i>	55
<i>pisorum</i>	6, 36, 165	<i>pruni</i>	112
<i>rufimanus</i>	6, 36, 165	<i>Oecanthus indicus</i>	205
<i>Myzus persicæ</i>	5	<i>Oecophora oliviella</i>	157
<i>Nacerdes melanura</i>	213	<i>Edaleus infernalis</i>	205
<i>Nanophyes tamaricis</i>	211	<i>nigrofasciatus</i>	205
Narcissus fly (see <i>Merodon</i> spp.).		<i>Olenecamptus bilobus</i>	103
Natal fruit fly (see <i>Ceratitis rubivora</i>).		<i>Olethreutes cynobatella</i>	113
<i>Necrobia rufipes</i>	5	<i>hercyniana</i>	79
Needle-nose hopbug (see <i>Calocoris fulvomacu-</i>		<i>pruniana</i>	177
<i>latus</i>).		<i>variegana</i>	179
<i>Nematus erichsoni</i>	6	<i>Oliarus oryzæ</i>	206
(<i>Croesus</i>) <i>septentrionalis</i>	13, 47, 149, 182	Olive fly (see <i>Dacus oleæ</i>).	
<i>Neolecanium plebeium</i>	102	moth (see <i>Prays oleellus</i>).	
<i>silveirai</i>	130	white fly (see <i>Aleurolobus olivinus</i>).	
<i>Neomaskellia bergii</i>	207	<i>Omiodes accepta</i>	203
<i>Nephopteryx rubrizonella</i>	168	<i>Omphisa anastomosalis</i>	209
<i>sagittiferella</i>	57	<i>Oncopeltus quadriguttatus</i>	90
<i>Nephotettix apicalis</i>	190, 206	Onion fly (see <i>Eumerus strigatus</i>).	
<i>Nepticula sericopeza</i>	148	maggot (see <i>Hylemyia antiqua</i>).	
<i>Nesosydne ipomæicola</i>	210	thrips (see <i>Thrips tabaci</i>).	
<i>Nezara viridula</i>	207, 215	<i>Opatrum</i> [see <i>Gonocephalum</i> (<i>Opatrum</i>)].	
<i>Nicertoides saccharivora</i>	206	<i>Ophonus pubescens</i>	81
<i>Nidularia pulvinata</i>	153	<i>Ophthalmodes cretacea</i>	212
Nigeria fruit fly (see <i>Ceratitis nigerrima</i>).		<i>Opisthoscelis conica</i>	99
<i>Nirvana pallida</i>	206	<i>fibularis</i>	99
<i>suturalis</i>	206	<i>globosa</i>	99
<i>Nisia atrovonosa</i>	190, 206	<i>maculata</i>	99
<i>Nitocris usambica</i>	63	<i>mammularis</i>	99
<i>Nodostoma lateralis</i>	207	<i>maskelli</i>	99
<i>Nola metallopa</i>	99	<i>nigra</i>	99
<i>Nonagria exitiosa</i>	208	<i>pisiformis</i>	99
<i>inferens</i>	191, 208	<i>serrata</i>	99
<i>uniformis</i>	123, 208	<i>spinosa</i>	99

	Page.		Page.
<i>Opisthoscelis subrotunda</i>	99	<i>Panolis griseovariegata</i>	71
<i>verrucula</i>	99	Papaya fruit fly (see <i>Toxotrypana curvicauda</i>).	
<i>Opogonia apicalis</i>	208	<i>Papilio demoleus</i>	57
<i>aurisquamosa</i>	208	<i>idæus</i>	60
<i>dimidiatella</i>	208	<i>Paralecanium cocophyllæ</i>	162
<i>fumiceps</i>	208	<i>expansum</i>	102
<i>saccharella</i>	208	<i>geometricum</i>	35
<i>Opomyza florum</i>	126	<i>Paralipsa modesta</i>	191
Orange rust mite (see <i>Eriophyes oleivorus</i>).		<i>Paraphrus granulatus</i>	153
<i>Orchestes alni</i>	12, 96	<i>Parasa lepida</i>	64
<i>decoratus</i>	222	<i>Paratettix gracilis</i>	205
<i>fagi</i>	40	<i>singularis</i>	205
<i>ferrugineus</i>	96	<i>Parlatoria affinis</i>	23, 26, 156, 166
<i>populi</i>	181, 222	<i>blanchardii</i>	162
<i>rufus</i>	96	<i>calianthina</i> ..	23, 24, 35, 59, 156, 166, 169, 192
<i>salicis</i>	181	<i>cinerea</i>	59
<i>testaceus scutellaris</i>	12	<i>greeni</i>	162
<i>Oregma lanigera</i>	207	<i>myrtus</i>	219
<i>Orgyia antiqua</i>	70, 149, 223	<i>mytilaspidiformis</i>	158, 162
<i>gonostigma</i>	112	<i>proteus</i>	5, 158, 162
<i>postica</i>	64, 212	<i>virescens</i>	192
<i>Oria musculosa</i>	126	<i>pseudaspidiotus</i>	5, 146, 158
<i>Orthezia insignis</i>	59, 212	<i>pyri</i>	23, 169
<i>prælonga</i>	59	<i>sinensis</i>	59
<i>Ortheziola fodiens</i>	63	<i>ziziphus</i>	5, 59, 131
<i>Orthorrhinus cylindrirostris</i>	60	<i>Parnara mathias</i>	191, 208
<i>kluggi</i>	131	<i>Paropsis picea</i>	10
<i>Orthotomicus erosus</i>	74	<i>Parthenothrips</i> (?) <i>kobusi</i>	207
<i>laricis</i>	69	Pea aphid (see <i>Macrosiphum pisi</i>).	
<i>longicollis</i>	74	midges (see <i>Contarinia pisi</i>).	
<i>proximus</i>	69	moths (see <i>Laspeyresia</i> spp.).	
<i>suturalis</i>	69	pod borer (see <i>Etiella zinckenella</i>).	
<i>Oryctes rhinoceros</i>	160, 207	weevils [see <i>Mylabris</i> (<i>Bruchus</i>) spp.].	
<i>Oscinis frit</i>	125	Peach fruit fly (see <i>Dacus persicæ</i>).	
<i>pusilla</i> (see <i>Oscinis frit</i>).		Pear borer (see <i>Agrilus sinuatus</i>).	
<i>Ostoma</i> [see <i>Lophocateres</i> (<i>Ostoma</i>)].		fruit borer (see <i>Nephopteryx rubrizonella</i>).	
<i>Otiorhynchus</i> (see <i>Brachyrhinus</i>).		gall midges (see <i>Contarinia pyrivora</i>).	
<i>Oxya annulicornis</i>	205	leaf blister mite (see <i>Eriophyes pyri</i>).	
<i>intricata</i>	190, 205	curling midges (see <i>Dasyneura pyri</i>).	
<i>velox</i>	190, 205	scale (see <i>Aspidiotus ostreæformis</i>).	
<i>Oxycarenus dudgeoni</i>	90	thrips (see <i>Tæniothrips pyri</i>).	
<i>gossipinus</i>	90	tingis (see <i>Stephanitis pyri</i>).	
<i>hyalinipennis</i>	90	tree psylla (see <i>Psylla pyricola</i>).	
<i>lætus</i>	90	<i>Pectinophora gossypiella</i>	88
<i>Oxythrips binervis</i>	207	<i>Pedinus femoralis</i>	43, 216
<i>Oxythyrea funesta</i>	216	<i>Pegomya</i> [see <i>Chortophila</i> (<i>Pegomya</i>) spp.].	
Oyster-shell scale (see <i>Lepidosaphes ulmi</i>).		<i>Peltophora pedicillata</i>	103, 172
<i>Pachnæus azureus</i>	63	<i>Pemphigus bursarius</i>	181
<i>litus</i>	63	<i>filaginis</i>	181
<i>Pachydissus sericus</i>	10	<i>immunis</i>	181
<i>Pachymerus chinensis</i>	6, 36, 37, 165	<i>marsupialis</i> (see <i>P. filaginis</i>).	
<i>quadrimaculatus</i>	6, 36, 37, 165	<i>napæus</i>	181
<i>Pachyrhina crocata</i>	70	<i>vesicalis</i>	181
<i>maculata</i>	44	<i>Pentodon punctatus</i>	216
<i>Pachytus sulcicollis</i>	215	Perak pomelo moth (see <i>Nephopteryx sagittiferella</i>).	
<i>Pachtylus migratorioides</i>	205	<i>Peridroma</i> sp.....	6
<i>migratorius</i>	26	<i>Periscopus mundulus</i>	207
<i>Pachyzancla phæopteralis</i>	185	<i>Perkinsiella</i> spp.....	206
Painted apple moth (see <i>Teia anartoides</i>).		<i>amboinensis</i>	206
<i>Palæococcus fuscipennis</i>	73, 147, 153	<i>bicoloris</i>	206
<i>rosæ</i>	130	<i>graminicola</i>	206
<i>Palembus ocularis</i>	210	<i>lalokensis</i>	206
Palm weevil (see <i>Rhynchophorus palmarum</i>).		<i>pallidula</i>	206
<i>Pamphila dara</i>	208	<i>papuensis</i>	206
<i>Pamphilius flaviventris</i>	169, 180		

	Page.
<i>Perkinsiella rattlei</i>	206
<i>saccharicida</i>	198, 206
<i>sinensis</i>	206
<i>variegata</i>	206
<i>vastatrix</i>	206
<i>vitiensis</i>	206
<i>Peronea ferrugana</i>	12, 40, 47
<i>Persectania evengi</i>	185
Peruvian cotton-square weevil (see <i>Anthonomus vestitus</i>).	
fruit fly (see <i>Anastrepha peruviana</i>).	
potato weevil (see <i>Trypopermnon latithorax</i> ; <i>Premnotrypes solani</i>).	
<i>Petrognatha gigas spinosa</i>	103
<i>Phænops cyanea</i>	73
<i>Phalera bucephala</i>	12, 40, 47, 96, 108, 134, 192
<i>combusta</i> (see <i>Anticyra</i>).	
<i>Phalonia epilina</i>	104
<i>Phaonia trimaculata</i>	49
<i>Pharaxonotha kirschi</i>	122
<i>Phenacaspis</i> [see <i>Chinaspis</i> (<i>Phenacaspis</i>)].	
<i>Phenacoccus aceris</i>	11, 134, 222
<i>iceryoides</i>	146
<i>mangiferæ</i>	146
<i>pergandei</i>	170
<i>piceæ</i>	81
<i>socius</i>	121
<i>Phenacoleachia zealandica</i>	39
<i>Phenice maculosa</i>	206
<i>moesta</i>	206
<i>Philephedra theobromæ</i>	50
Philippine orange moth (see <i>Prays citri</i>).	
<i>Phissama interrupta</i>	208
<i>Phlæoba infumata</i>	205
<i>Phlæophthorus spinulosus</i>	81
<i>rhododactylus</i>	81
<i>Phlæosinus thujæ</i>	25, 140
<i>zhobi</i>	74
<i>Phlæothrips lucasseni</i>	207
<i>oleæ</i>	156
<i>pallidicornis</i>	207
<i>Phlæotribus caucasicus</i>	27
<i>oleæ</i>	157
<i>Phlyctænia despecta</i>	210
<i>ferrugalis</i>	6, 44
<i>Phænicococcus marlatti</i>	162
<i>Phoracantha recurva</i>	97
<i>tricuspis</i>	97
<i>Phorbia vicina</i> [see <i>Chortophila</i> (<i>Pegomya</i>) <i>hyoscyami</i>].	
<i>Phorodon humuli</i>	5
<i>Phosphuga atrata</i>	43
<i>Phryneta cæca</i>	195
<i>conradti</i>	103
<i>hecphora</i>	195
<i>spinator</i>	103
<i>Phthorimæa operculella</i>	216, 217
<i>Phycita abietella</i>	52, 70
<i>infusella</i>	91
<i>Phylaitis</i> sp.....	91
<i>Phylan gibbus</i>	73, 153
<i>Phyllaphis fagi</i>	39
<i>Phyllobius argentatus</i>	39, 46
<i>betulæ</i>	46
<i>maculicornis</i>	17, 46

	Page.
<i>Phyllobius oblongus</i>	110
<i>pyri</i>	46
<i>sinuatus</i>	46
<i>urticæ</i>	39
<i>viridicollis</i>	39
<i>Phyllocnistis citrella</i>	58
<i>Phylloëcta</i> spp.....	221
<i>tibialis</i>	221
<i>vitellinæ</i>	6, 181, 221
<i>vulgatissima</i>	221
<i>Phyllognathus dionysius</i>	190
<i>Phyllopertha horticola</i>	109
<i>Phyllophaga clypealis</i>	193
<i>problematica</i>	193
<i>Phyllotoma vagans</i>	13
<i>Phyllotreta</i> spp.....	91
<i>armoraciæ</i>	6, 91, 138
<i>atra</i>	44, 91, 138
<i>cruciferæ</i>	44, 91
<i>nemorum</i>	44, 91, 137, 189
<i>nigripes</i>	44, 91, 138
<i>undulata</i>	91
<i>vittata</i>	6
<i>vittula</i>	44, 126, 187
<i>Phymatodes lividus</i>	138, 153, 222
<i>testaceus</i>	153
<i>Physokermes piceæ</i>	81
<i>Physopus sernotatus</i>	207
<i>Phytalus smithi</i>	199
<i>Phytocoris pabulinus</i>	184
<i>Phytomyza affinis</i>	51, 53, 164, 165, 215
<i>nigricornis</i> (see <i>P. affinis</i>).	
<i>Phytonomus</i> (see <i>Hypera</i>).	
<i>Phytophaga destructor</i>	7, 124
<i>Phytoscapus formosanus</i>	207
<i>Piesarthrius marginellus</i>	10
<i>Pieris monuste</i>	49
Pigmy mangold beetle (see <i>Atomaria linearis</i>).	
<i>Pileus hyalinatus</i>	10
Pine bark beetle (see <i>Xylotrechus quadripes</i>).	
bud and gall moths (see <i>Evetria</i> spp.).	
moth (see <i>Gelechia dodecella</i>).	
gall mite (see <i>Eriophyes pini</i>).	
geometrid (see <i>Bupalus piniarius</i>).	
needle midge (see <i>Thecodiplosis brachyn-tera</i>).	
noctuid (see <i>Panolis griseovariegata</i>).	
procession moths (see <i>Cnethocampa</i> spp.).	
shoot moth (see <i>Evetria buoliana</i>).	
spinner (see <i>Dendrolinus pini</i>).	
<i>Pineus orientalis</i>	67
<i>pini</i>	67
<i>sibiricus</i>	67
<i>strobi</i>	67
Pink bollworm (see <i>Pectinophora gossypiella</i>).	
<i>Pinnaspis bambusæ</i>	32
<i>buxi</i>	5, 44, 162
<i>longula</i>	158
<i>rhombica</i>	30
<i>Pionea ferrugalis</i>	53, 93, 141, 164, 192
<i>forficalis</i>	53, 138
<i>Pissodes harcyniæ</i>	68
<i>notatus</i>	68
<i>piceæ</i>	68

	Page.		Page.
<i>Pissodes pini</i>	68	<i>Polydrusus picus</i>	39
<i>piniphilus</i>	68	<i>planifrons</i>	46
Pitchy-legged weevil (see <i>Brachyrrhinus</i>		<i>sericeus</i>	6, 39
<i>picipes</i>).		<i>undatus</i>	46, 73
Pith moths (see <i>Blastodacna</i> spp.).		<i>villosulus</i>	73
<i>Pityocnecus bidentatus</i>	69	<i>viridicollis</i>	6, 39
<i>bistridentatus</i>	69	<i>Polygraphus aterrimus</i>	52
<i>chalcographus</i>	69	<i>grandiclava</i>	75
<i>coniferæ</i>	52, 69	<i>himalayensis</i>	75
<i>lipperti</i>	74	<i>longifolia</i>	75
<i>pilidens</i>	69	<i>major</i>	52, 69
<i>quadridens</i>	69	<i>nigra</i>	75
<i>trepanatus</i>	74	<i>pini</i>	69
<i>Pityokteines curvidens</i>	69	<i>polygraphus</i>	69
<i>spinidens</i>	79	<i>subopacus</i>	70
<i>vorontzowi</i>	79	<i>trenchi</i>	75
<i>Pityophthorus exculptus</i>	81	<i>Polyocha saccharella</i>	204
<i>glabratus</i>	75	<i>Polyphylla fullo</i>	10, 39, 46, 73
<i>lichtensteini</i>	75	<i>Pontania salicis</i>	223
<i>micrographus</i>	69	<i>Pontia rapæ</i>	6
<i>sampsoni</i>	74	Poplar borers (see <i>Saperda</i> spp.).	
<i>Plantia affinis</i>	190	<i>curculio</i> (see <i>Cryptorhynchus lapathi</i>).	
<i>Plateros dispallens</i>	212	<i>Porricondyla cercalis</i>	124
<i>Platinglisia noacki</i>	35	<i>gossypii</i>	89
<i>Platyparæa pæcilopecta</i>	29	Porter's white fly (see <i>Aleurothrixus porteri</i>).	
<i>Platypus biformis</i>	75	<i>Porthesia similis</i>	40, 47, 108, 137, 141, 148, 149, 154, 181, 223
<i>cupulatus</i>	218	<i>virguncula</i>	91
<i>curtus</i>	194	<i>Porthetria dispar</i>	6, 12, 40, 47, 107, 137, 141, 148, 154, 181, 223
<i>cylindrus</i>	154	Potato lady-bird beetle (see <i>Epilachna</i> spp.).	
<i>taluræ</i>	194	root mite (see <i>Rhizoglyphus echinopus</i>).	
<i>Plécoptera reflexa</i>	195	<i>Praonetha melanura</i>	50, 63
<i>Plemeliclla abietina</i>	78	<i>Prays citri</i>	57
<i>Plocæderus obesus</i>	193	<i>curtiscllus</i>	27
<i>ruficornis</i>	143	<i>oleellus</i>	155
<i>Plodia interpunctella</i>	6	<i>Premnotrypes solani</i>	184
Plum blister mites (see <i>Eriophycs</i> spp.).		<i>Prionus corpulentus</i>	153
borer (see (<i>Rhynchites cupreus</i>)).		<i>Priophorus padi</i>	47, 133, 149, 170, 177, 179
bud moth (see <i>Olethreutes pruniana</i>).		<i>Prociophilus bumeliæ</i>	26, 78
fruit sawfly (see <i>Hoplocampa fulvi-</i>		<i>Procodeca adara</i>	208
<i>cornis</i>).		<i>Prodenia litura</i>	14, 91, 191, 216, 217
leaf sawfly (see <i>Priophorus padi</i>).		<i>Promecotheca cumingii</i>	160
stem piercer (see <i>Magdalis armigera</i>).		<i>reichei</i>	160
psylla (see <i>Psylla pruni</i>).		<i>Prosternon holosericeus</i>	153
sawfly (see <i>Eriocampoides limacina</i>).		<i>Protodiaspis anomala</i>	9
<i>Plusia argentifera</i>	216	<i>Psalis securis</i>	208
<i>chalcites</i>	210	<i>Psallidium marillosum</i>	44
<i>gamma</i>	6, 44, 216	<i>Psammæcus trimaculatus</i>	33
<i>nigrisigna</i>	14	<i>Pseudaonidia</i> [see <i>Aspidiotus</i> (<i>Pseudaonidia</i>)].	
<i>Plutella maculipennis</i>	6, 49	<i>Pseudischnaspis</i> [see <i>Aspidiotus</i> (<i>Pseudischnas-</i>	
<i>Podisma alpina</i>	11	<i>pis</i>)].	
<i>Podontia 14-punctata</i>	103	<i>Pseudoclavellaria amerinæ</i>	182, 223
<i>Pæcilonota rutilans</i> (see <i>Lampra</i>).		<i>Pseudococcus acaciæ</i>	9
<i>variolosa</i>	181, 222	<i>albizziae</i>	10
<i>Pogonochærus fasciculatus</i>	68	<i>ananassæ</i>	171
<i>Poliaspis cycadis</i>	162	<i>arecæ</i>	121
<i>pini</i>	73, 79	<i>aurilanus</i>	25
<i>Pollinia pollini</i>	156	<i>boninsus</i>	206
<i>Polychrosis botrana</i>	130, 131	<i>brevipes</i>	171
<i>Polydrusus cervinus</i>	39, 46	<i>bromeliæ</i>	94, 171, 206
<i>chærodrysus</i>	73	<i>calceolariæ</i>	206
<i>chrysomela</i>	39	<i>citri</i>	59
<i>griseomaculatus</i>	39	<i>cocotis</i>	163
<i>intermedius</i>	46, 73	<i>coffææ</i>	63
<i>lateralis</i>	39	<i>dubia</i>	163
<i>micans</i>	39		
<i>mollis</i>	39		

	Page.		Page.
<i>Pseudococcus farnesianæ</i>	10	<i>Pulvinaria plana</i>	35
<i>ficus</i>	102	<i>sericea</i>	153
<i>filamentosus</i>	10, 59, 130	<i>simulans</i>	30
<i>glaucus</i>	23, 158	<i>thex</i>	212
<i>grandis</i>	131	<i>vinifera</i>	130
<i>grassi</i>	34	Purple scale of the orange (see <i>Lepidosaphes</i>	
<i>glaucus</i>	158	<i>beckii</i>).	
<i>indicus</i>	35	<i>Purpuriscenus wachanrui</i>	181
<i>laurinus</i>	35	<i>Puto antennata</i>	73
<i>lobulatus</i>	99	Pyralid of the vine (see <i>Polychrosis botrana</i>).	
<i>nitidus</i>	10	<i>Pyrausta nubilalis</i>	85, 123, 135, 137
<i>pandani</i>	163	<i>Pyrilla aberrans</i>	206
<i>pini</i>	73	<i>Pyroderces simplex</i>	88
<i>quæsitus</i>	10	<i>Pyrhodium sanguineum</i>	153
<i>sacchari</i>	206	<i>Pyrhocoris apterus</i>	141
<i>saccharifolii</i>	206	Queensland fruit fly (see <i>Batrocera tryoni</i>).	
<i>setosus</i>	102	Quince borer (see <i>Cossus tristis</i>).	
<i>solitarius</i>	10	<i>Racilia okinawensis</i>	190, 205
<i>subterraneus</i>	130	Radish fly (see <i>Anthomyia radicum</i>).	
<i>swezeyi</i>	10	Rape flea-beetle (see <i>Psylliodes</i> spp.).	
<i>texensis</i>	5, 206	seed worm (see <i>Evergestis extimalis</i>).	
<i>viburni</i>	219	Rarotonga fruit fly (see <i>Dacus rarotongæ</i>).	
<i>virgatus</i>	30, 63, 102, 131, 163	Red-banded thrips (see <i>Heliothrips rubro-</i>	
<i>vitis</i>	130	<i>cinctus</i>).	
<i>vovæ</i>	139	coffee borer (see <i>Zcuzera coffeæ</i>).	
<i>Pseudocolaspis indica</i>	54	gooseberry mite (see <i>Bryobia ribis</i>).	
<i>Pseudokermes nitens</i>	131	gum-tree weevil (see <i>Strongylorhinus och-</i>	
<i>Pseudoparlatoria ostriata</i>	163	<i>raceus</i>).	
<i>parlatorioides</i>	30, 166	-headed fir worm (see <i>Enarmonia rufimi-</i>	
<i>Pseudotargionia glandulosa</i>	9	<i>trana</i>).	
<i>Psiloptera fastuosa</i>	212	-legged ham beetle (see <i>Necrobia rufipes</i>).	
<i>viridans</i>	193, 218	maggot of cotton (see <i>Porricondyla gos-</i>	
<i>Psyche</i> spp.....	211	<i>sypii</i>).	
<i>albipes</i>	211	palm weevil (see <i>Rhynchophorus ferru-</i>	
<i>assamica</i>	211	<i>gineus</i>).	
<i>viciella</i>	197	plum maggot (see <i>Laspeyresia func-</i>	
<i>Psylla alni</i>	11	<i>brana</i>).	
<i>cistellata</i>	143	spider (see <i>Tetranychus</i> spp.).	
<i>mali</i>	16	tail moth (see <i>Dasychira pudibunda</i>).	
<i>pruni</i>	172	<i>Remigia frugalis</i>	208
<i>pyricola</i>	5	<i>Reseliella piccæ</i>	81
<i>pyrisuga</i>	167	<i>Rhabdocnemis obscurus</i>	34, 163, 201
<i>Psylliodes attenuata</i>	44, 135	<i>Rhabdophaga</i> spp.....	222
<i>chrysocephala</i>	44, 49, 188	<i>nielsonii</i>	222
<i>napi</i>	49, 188	<i>saliciperda</i>	182, 222
<i>Pteleobius kraatzi</i>	96	<i>salicis</i>	222
<i>vittatus</i>	96	<i>Rhadinoscopus nocturnus</i>	64
<i>Pterochlorus exsiccator</i>	39, 152	<i>Rhagium mordax</i>	46
<i>Pteronidea salicis</i>	223	<i>Rhagoletis pardalina</i>	93
<i>ribesii</i>	6	<i>Rhigopsidius tucumanus</i>	183
<i>Pterostichus lepidus</i>	81	<i>Rhinaria perdix</i>	47, 197
<i>vulgaris</i>	196	Rhinoceros beetle (see <i>Oryctes rhinoceros</i>).	
<i>Ptilinus fuscus</i>	181, 222	<i>Rhinomacer attelaboides</i>	73
<i>pectinicornis</i>	12, 39, 137, 148, 153, 222	<i>Rhinotia hæmoptera</i>	10
<i>Ptyelus costalis</i>	190, 206	<i>Rhizococcus intermedius</i>	39
<i>Pulvinaria aurantii</i>	59	<i>lobatulatus</i>	10
<i>betulæ</i>	39, 45, 132, 134, 137, 179, 181, 222	<i>pulchellus</i>	39
<i>alni</i>	11	<i>totaræ</i>	39
<i>camelicola</i>	63	<i>Rhizæcus eloti</i>	63
<i>cellulosa</i>	59	<i>falcifer</i>	130, 163, 192
<i>cupaniæ</i>	131	(?) <i>terrestris</i>	163
<i>ficus</i>	63, 102, 131, 146	<i>Rhizoglyphus</i> (<i>Coepophagus</i>) <i>echinopus</i>	5,
<i>floccifera</i>	158	158, 164, 183
<i>iceryi</i>	206	<i>Rhizopertha collaris</i>	17
<i>jacksoni</i>	102	<i>dominica</i>	6
<i>mammææ</i>	30, 63, 102, 146	<i>Rhizotrogus æquinotialis</i>	43

	Page.		Page.
<i>Rhopalopus insubricus</i>	148	<i>Scirpophaga intacta</i>	208
<i>Rhynchites alni</i>	39	<i>monostigma</i>	208
<i>betulæ</i>	12, 39, 46	<i>Scolytochelus ensifer</i>	96
<i>cæruleus</i>	173	<i>Scolytochelus kirschi</i>	96
<i>cupreus</i>	173, 174	<i>multistriatus</i>	27
<i>Rhyncolus ater</i>	68	<i>Scolytoplatypus darjcelingi</i>	154
<i>Rhyncolus cylindricus</i>	68	<i>himalayensis</i>	79
<i>elongatus</i>	68	<i>Scolytus aceris</i>	148
<i>himalayensis</i>	52, 68	<i>amygdali</i>	25, 167
<i>lignyarius</i>	40, 68	<i>assimilis</i>	174
<i>porcatus</i>	68	<i>carpini</i>	137
<i>strangulatus</i>	68	<i>deodara</i>	52
<i>truncorum</i>	40, 68	<i>intricatus</i>	40, 154
<i>Rhynchophorus ferrugineus</i>	161	<i>lævis</i>	96
<i>palmarum</i>	161, 207	<i>major</i>	52
<i>signaticollis</i> (see <i>Rhyncho-</i>		<i>mali</i>	24, 54, 96, 149, 179
<i>phorus ferrugineus</i>).		<i>minor</i>	52
<i>Ricania tæniata</i>	206	<i>multistriatus</i>	96
Rice bug (see <i>Lepocorisa varicornis</i>).		<i>pruni</i>	24, 170, 174
flea-beetle (see <i>Chætocnema basalis</i>).		<i>pygmæus</i>	96
leaf-beetle (see <i>Hispa ænescens</i>).		<i>ratzeburgi</i>	46
hopper (see <i>Tettigoniella spectra</i>).		<i>rugulosus</i>	6, 46, 149
skipper (see <i>Parnara mathias</i>).		<i>scolytus</i>	27, 96
stem borer (see <i>Chilo auricilia</i> ; <i>Schoeno-</i>		<i>Scopelosoma satellitia</i>	40
<i>bipunctifer</i>).		<i>Scotinophora tarsalis</i>	207
<i>Rioxa musæ</i>	34, 118	Seed-corn maggot [see <i>Chortophila</i> (<i>Pegomya</i>)	
<i>Ripersia fagi</i>	39	<i>fusciceps</i>].	
<i>palmarum</i>	163	<i>Selatosomus æneus</i>	68, 153
<i>sacchari</i>	206	<i>Selidosema excursaria</i>	10
<i>Riptortus fuscus</i>	207	<i>lyciaria</i>	10
Rose sawfly (see <i>Caliroa aethiops</i> ; <i>Cladius pecti-</i>		<i>Semiothisa liturata</i>	75
<i>nicornis</i>).		<i>Serentlia formosana</i>	207
scale (see <i>Leucaspis japonica</i>).		<i>Serica assamensis</i>	193
<i>Rosenbergia megacephala</i>	103	<i>Serropalpus barbatus</i>	67
Rosy rustie (see <i>Hydræcia micæa</i>).		<i>Sesamia cretica</i>	85, 196, 203
Rust-red flour beetle (see <i>Tribolium ferrugi-</i>		<i>nonagrioides</i>	208
<i>neum</i>).		<i>Sesia conopiformis</i>	154
Rutherglen bug (see <i>Nysius vinitor</i>).		<i>culiciformis</i>	12
Rye midge (see <i>Lasioptera cerealis</i>).		<i>formicæformis</i>	223
stem borer (see <i>Ochsenheimeria taurella</i>).		<i>myopæformis</i>	21, 25
<i>Sacadodes pyralis</i>	91	<i>scolixæformis</i>	47
Šago palm scale (see <i>Diaspis zamixæ</i>).		<i>spheciformis</i>	12, 27, 47
<i>Sahlbergella singularis</i>	50	<i>vespiformis</i>	154
<i>Saissetia discoides</i>	131	<i>Setenis indosinica</i>	73
<i>mirifica</i>	10	<i>lævis</i>	193
<i>nigra</i>	63, 94, 102	<i>semiopaca</i>	68
<i>oleæ</i>	5	<i>semivalga</i>	193
<i>psidii</i>	131, 146	Shallot fly (see <i>Chortophila cilicrura</i>).	
<i>punctilifera</i>	146	She-oak root-borer (see <i>Stigmodera heros</i>).	
San José scale (see <i>Aspidiotus perniciosus</i>).		Shot-hole borer of tea (see <i>Xyleborus fornicat-</i>	
<i>Saperda</i> spp.....	180	<i>tus</i>).	
<i>carcharias</i>	6, 180, 181, 222	Siamese grain beetle [see <i>Lophocateres</i> (<i>Osto-</i>	
<i>populnea</i>	180, 181, 182, 222	<i>ma</i>) <i>pusillus</i>].	
<i>scalaris</i>	23, 39, 179, 180, 181, 220	Silky oak weevil borer (see <i>Æsiotes notabilis</i>).	
Sawfly (see <i>Macrophya punctum-album</i>).		<i>Silpha obscura</i>	43
Saw-toothed grain beetle (see <i>Silvanus surina-</i>		<i>Silvanus advena</i>	212
<i>mensis</i>).		<i>surinamensis</i>	5
Scale insects (see Coccidæ).....	7	<i>Sinoxylon anale</i>	33, 148, 193, 218
<i>Scapteriscus didactylus</i>	49	<i>crassum</i>	148, 193, 218
<i>Scelodnota strigicollis</i>	128	<i>perforans</i>	96, 127, 138, 153
<i>Schistoceros anobioides</i>	193	<i>serdentatum</i>	127
<i>Schizaspis lobata</i>	102	<i>sudanicum</i>	100
<i>Schizodactylus monstrosus</i>	89, 90, 215	<i>Siphonella pumilionis</i>	85
<i>Schænobius bipunctifer</i>	189	<i>Sirex gigas</i>	70
<i>Sciopteron regale</i>	129	<i>imperialis</i>	82
<i>tabaniformis</i>	181	<i>juvencus</i>	70
<i>Scirpophaga auriflua</i>	208	<i>spectrum</i>	70, 82
<i>chysorrhœa</i>	208	<i>Sitodrepa panicea</i>	6

	Page.		Page.
<i>Sitona</i> spp.....	60	<i>Strongylocephalus agrestis</i>	206
<i>flavescens</i>	6, 38, 60, 165	<i>Strongylorhinus ochraceus</i>	98
<i>hispidula</i>	6, 60, 165	<i>Strongylurus thoracicus</i>	52
<i>lineata</i>	38, 60, 165	<i>Strophosoma capitata</i>	39, 46
<i>linneceus</i>	60	<i>melanogramma</i>	39, 46
<i>meliloti</i>	61	<i>Suana concolor</i>	30, 132, 194
<i>sulcifrons</i>	61	<i>Subcoccinella 24-punctata</i>	14, 43
<i>Sitotroga cerealella</i>	6	Sucking bug (see <i>Ceratopachys variabilis</i>).	
Smaller bamboo shot-hole borer (see <i>Dinoderus minutus</i>).		Sugar-cane ambrosia beetle (<i>Xyleborus perforans</i>).	
<i>Smynthurus</i> sp.....	14	borer (see <i>Metamasius sericeus</i>).	
Social pear sawfly (see <i>Pamphilius flaviventris</i>).		moths (see <i>Diatraea</i> spp.).	
<i>Solenococcus fagi</i>	39	bud moth (see <i>Ereunetis flavistriata</i>).	
<i>muratæ</i>	130, 219	frog hopper (see <i>Tomaspis</i> spp.).	
South Sea guava fruit fly (see <i>Dacus psidii</i>).		hispid miner (see <i>Hispid wakkeri</i>).	
Soy bean moth (see <i>Laspeyresia glycinivorella</i>).		leafhopper (see <i>Perkinsiella saccharicida</i>).	
<i>Spermophagus pectoralis</i>	36	mealy bug (see <i>Pseudococcus texensis</i>).	
<i>Sphærococcus acaciæ</i>	10	moth borer of India (see <i>Chilo simplex</i>).	
<i>Sphærotrypes assamensis</i>	193	red spider (see <i>Tetranychus exsicicator</i>).	
<i>globulus</i>	193	Swete-potato stem borer (see <i>Omphisa anastomosalis</i>).	
<i>siwalikensis</i>	193	weevil (see <i>Cylas formicarius</i>).	
<i>Sphenophorus sordidus</i> (see <i>Cosmopolites</i>).		Swan moth (see <i>Porthesia similis</i>).	
<i>Sphenoptera aterrima</i>	52	<i>Sylepta derogata</i>	91, 155
<i>gossypii</i>	90	<i>Symphyletes neglectus</i>	10
<i>lafertei</i>	52	<i>nigrovirens</i>	10
<i>neglecta</i>	90	<i>vestigialis</i>	10
<i>Spilosoma fuscinula</i>	99	<i>Syngenaspis parlatoreæ</i>	81
Spinach aphid (<i>Myzus persicæ</i>).		<i>Tachardia acaciæ</i>	10
leaf miner (see <i>Pegomya hyoscyami</i>).		<i>fici</i>	103
Spined log beetle (see <i>Xenocnema spinipes australiæ</i>).		<i>lacca</i>	103
Spiny citrus white fly (see <i>Aleurocanthus woglumi</i>).		<i>Tæniotes scalaris</i>	101
<i>Spodoptera mauritia</i>	8, 191, 210, 216	<i>Tæniothrips pyri</i>	5
<i>pecten</i>	208	<i>Takahashia citricola</i>	59
Spruce bark tortricid (see <i>Laspeyresia pactolana</i>).		<i>japonica</i>	59
borer (see <i>Tetropinum castaneum</i>).		<i>Tanymecus rusticus</i>	207
cone moth (see <i>Laspeyresia strobilella</i>).		<i>Taphrorychus bicolor</i>	40, 170
gall midge (see <i>Dasyneura piccæ</i>).		<i>villifrons</i>	40
nest worm (see <i>Laspeyresia tedella</i>).		<i>Tapinostola musculosa</i> (see <i>Oria</i>).	
wood wasp (see <i>Sirex spectrum</i>).		<i>Tarache catena</i>	91
<i>Stauropus alternus</i>	51, 64, 146, 212	<i>Targionia</i> [see <i>Aspidiotus (Targionia)</i>].	
<i>Steganoptycha</i> (see <i>Enarmonia rufimitrana</i>).		Tarnished plant bug (see <i>Lygus pratensis</i>).	
<i>Steirastoma depressum</i>	50	Tea bag worms (see <i>Psyche</i> spp.).	
<i>Stenobothrus formosanus</i>	205	<i>Tæara contraria</i>	10, 100
<i>Stenocranus saccharivora</i>	198	<i>Teia anartoides</i>	10, 24, 113, 179
<i>sacchari</i>	206	<i>Teledapus dorcadoides</i>	52, 81
<i>Stenothrips</i> (?) <i>zehntneri</i>	207	<i>Telicota augias</i>	20
<i>Stephanitis pyri</i>	167, 168	<i>Tenebrioides mauritanicus</i>	
<i>Sternochetus gravis</i>	143, 144	<i>Tephrites</i> [see <i>Dacus (Tephrites)</i>].	
<i>mangiferæ</i>	144, 145	<i>Termes australis</i>	15, 59, 99
<i>Sternotomis bohemani</i>	10	<i>Termissa nivosa</i>	99
<i>imperialis</i>	63	Termites (see <i>Termitidæ</i>)	
<i>regalis</i>	63	<i>Termitidæ</i>	7
<i>Stigmodera heros</i>	97	<i>Tetigonia albida</i>	206
<i>Stilpnotia salicis</i>	181, 223	<i>ferruginea</i>	206
<i>Stomaphis longirostris</i>	152	<i>viridis</i>	190, 206
<i>quercus</i>	152	<i>Tetraneura pallida</i>	95
Straw fly (see <i>Chlorops tæniopus</i>).		<i>ulmi</i>	95
Strawberry root weevil (see <i>Brachyrhinus ovatus</i>).		<i>Tetranychus bimaculatus</i>	197
<i>Stromatium barbatum</i>	33, 212	<i>bioculatus</i>	62, 212
<i>longicorne</i>	212	<i>exsicicator</i>	197

	Page.		Page.
<i>Tetranychus telarius</i>	43	<i>Trypophlæus alni</i>	12
<i>Tetropium castaneum</i>	65, 68	<i>Trypopremnon latithorax</i>	184
<i>fuscum</i>	79	<i>Tryxalis nasuta</i>	205
<i>oreinum</i>	52	Turnip flower beetle (see <i>Meligethes æneus</i>).	
<i>Tettigoniella spectra</i>	190	sawfly (see <i>Athalia spinarum</i>).	
<i>Tettix formosanus</i>	205	Twig cutter (see <i>Rhynchites cæruleus</i>).	
<i>Thalaina clara</i>	10	<i>Uracanthus acutus</i>	24, 166, 179
<i>Thamnonoma wauaria</i>	120	<i>bivittata</i>	10
<i>Thecodiplosis brachyntera</i>	72	<i>cryptophagus</i>	59
<i>Thliptoceras octoguttata</i>	64	<i>simulans</i>	10
Three-striped fruit fly (see <i>Dacus diversus</i>).		<i>strigosus</i>	10
Thrips (see Thysanoptera.)		<i>triangularis</i>	10
<i>Thrips minuta</i>	207	<i>Vesperus</i> spp.	127
<i>sacchari</i>	207	<i>luridis</i>	127
<i>serrata</i>	207	<i>mauretanicus</i>	127, 157
<i>tabaci</i>	5	<i>strepens</i>	127, 192
Thysanoptera	7	<i>ratarti</i>	127
Timber beetle (see <i>Nacerdes melanura</i>).		Viburnum scale (see <i>Chrysomphalus perseæ</i>).	
<i>Tinea granella</i>	6, 123	Victoria bean beetle fly (see <i>Zizera labradus</i>).	
<i>Tipula oleracea</i>	44	white ant (see <i>Termes australis</i>).	
<i>paludosa</i>	44	Vine flea-beetle (see <i>Haltica ampelophaga</i>).	
<i>Tischeria complanella</i>	54, 154	<i>Vinsonia stellifera</i>	103, 146
<i>simploniella</i>	154	<i>Virachola insocrates</i>	112, 132, 142, 180
Tobacco stem borer (see <i>Gnorimoschema heli-</i>		<i>livia</i>	163, 180
<i>opa</i>).		Watercress caddis worm (see <i>Limnophilus</i>	
white flies (see <i>Aleyrodes</i> spp.).		<i>flavicornis</i>).	
<i>Tomaspis lepidior</i>	85, 197, 198	Weevils.....	8
<i>postica</i>	85, 197, 198	West Indian cane fly (see <i>Stenocranus sac-</i>	
<i>varia</i>	85, 197, 198	<i>charivora</i>).	
Tomato weevil (see <i>Desiantha nociva</i>)		sugar-cane borer (see <i>Metama-</i>	
<i>Tomicus</i> (<i>Myelophilus</i>) <i>minor</i>	69	<i>sus hemipterus</i>).	
<i>piniperda</i>	66, 69	sugar-cane root borer (see <i>Dia-</i>	
Tonga fruit fly (see <i>Dacus tongensis</i>).		<i>prepes abbreviatus</i>).	
<i>Tortrix ashworthana</i>	22	sweet-potato weevil (see <i>Eusce-</i>	
<i>divulsana</i>	14	<i>pes batataæ</i>).	
<i>histrionana</i>	82	Wheat bulb fly (see <i>Hylemyia coarctata</i>).	
<i>murinana</i>	79	moth (see <i>Tinea granella</i>).	
<i>piceana</i>	70	plant louse (see <i>Aphis avenæ</i>).	
<i>podana</i>	27, 40	stem borer (see <i>Nonagria uniformis</i>).	
<i>viburniana</i>	70	White ant (see <i>Coptotermes gestroi</i>).	
<i>viridana</i>	54, 152	Willow curculio (see <i>Cryptorhynchus lapathi</i>).	
<i>Toxotrypana curvicauda</i>	163	gall midge (see <i>Rhabdophaga</i> spp.).	
<i>Trabala vishnu</i>	194	leaf beetles (see <i>Crepidodera aurata</i> ;	
<i>Trachea brasilinea</i>	126	<i>Phyllodecta</i> spp.).	
<i>Tragocephala senatoria</i>	50	Winter moth (see <i>Cheimatobia brumata</i>).	
<i>Trialetrodes vaporariorum</i>	213	turnip gnat (see <i>Trichocera hiemalis</i>).	
<i>Tribolium castaneum</i>	33	<i>Xenocnema spinipes australiæ</i>	195
<i>confusum</i>	5, 33	<i>Xeris spectrum</i>	70
<i>ferrugineum</i>	6	<i>Xestobium plumbeum</i>	39, 73
<i>Trichetra marginalis</i>	100	<i>rufovillosum</i>	12,
<i>Trichiocampus viminalis</i>	182	39, 53, 137, 138, 148, 153, 171	
<i>Trichiosoma lucorum</i>	13, 47, 223	<i>Xiphidium varipenne</i>	190
<i>Trichocera hiemalis</i>	219	<i>Xiphidrya camelus</i>	13, 40
<i>Tridactylus flavomaculatus</i>	205	<i>prolongata</i>	47
<i>Trigonidium haani</i>	205	<i>Xoanodera regularis</i>	103
<i>Trilophidia annulata</i>	205	<i>Xyleborus andrewesi</i>	193
<i>Trinophylum cribratum</i>	52	<i>bengalensis</i>	193
<i>Triphæna pronuba</i>	216, 218	<i>coffææ</i>	62
<i>Trochilium</i> spp.....	180	<i>cryptophagus</i>	181
<i>amnatæforme</i>	180	<i>dryographus</i>	40, 95, 154
<i>apiformis</i>	180	<i>eurygraphus</i>	75
<i>Tropidocephala brunneipennis</i>	206	<i>fallax</i>	193
<i>formosana</i>	206	<i>fornicatus</i>	211
<i>saccharivorella</i>	206	<i>improbis</i>	154
<i>Tryphocharia mastersi</i>	98	<i>major</i>	193

	Page.		Page.
<i>Xyleborus monographus</i>	40, 96, 154	<i>Xylotrechus stebbingi</i>	153
<i>morstatti</i>	64	<i>Xylotrupes dichotomus</i>	207
<i>perforans</i>	193, 202	<i>gideon</i>	207
<i>schlichii</i>	193	Yellow box borers (see <i>Phoracantha</i> spp.).	
<i>Xylechinus pilosus</i>	70	<i>Zabrus gibbus</i>	126
<i>Xylina ornithopus</i>	176	<i>Zamacra albofasciaria</i>	150
<i>socia</i>	96, 141, 176	<i>Zaratha cramerella</i>	50
<i>Xylococcus filifer</i>	141	<i>Zeuzera coffeæ</i>	30, 51, 55, 62, 91, 142, 212
<i>Xylonites retusus</i>	96	<i>eucalypti</i>	10
<i>Xyloterus domesticus</i>	12,	<i>pyrina</i>	6, 12, 27, 40, 46,
40, 46, 137, 141, 148, 149, 154		48, 96, 138, 141, 148, 149, 154, 181, 223	
<i>intermedius</i>	79	<i>Zizera labradus</i>	37, 165
<i>lineatus</i>	70	<i>Zonabris floralis</i>	184
<i>signatus</i>	40, 46, 141, 148, 154	<i>14-punctata</i>	184
<i>Xylotrechus gahani</i>	103	<i>Zophodia convolutella</i>	120, 121
<i>javanicus</i>	63	<i>Zygina circumscripta</i>	206
<i>quadripes</i>	63, 64	<i>maculifrons</i>	190, 206
<i>rusticus</i>	181	<i>subrufa</i>	190, 206
<i>smei</i>	193, 212		

PLANT INDEX.

	Page.		Page.
<i>Aberia caffra</i> (Kei apple).....	115, 140	<i>Acalypha marginata</i>	62
<i>Abies</i> spp. (fir). 26, 64, 65, 66, 67, 68, 69, 70, 77-79, 103, 196		<i>Acer</i> spp. (maple).....	17,
<i>balsamea</i> (balsam fir).....	69, 70, 78	65, 105, 107, 108, 138, 147, 148, 150, 221	
<i>excelsa</i> (see <i>Picea excelsa</i>).		<i>campestre</i>	147
<i>firma</i>	79	<i>negundo</i> (box elder).....	147
<i>fraseri</i> (She balsam).....	78	<i>platanoides</i> (Norway maple).....	147
<i>mariesii</i>	79	<i>pseudoplatanus</i> (sycamore maple).....	147
<i>nordmanniana</i>	67	<i>Achras</i> [see <i>Sideroxylon</i> (<i>Achras</i>)].	
<i>pectinata</i> (silver fir).....	67, 69, 70, 77, 78, 79	<i>Acronychia lævis</i> (eheesewood).....	114
<i>webbiana</i>	68, 70, 79	<i>Æsculus</i> spp. (horse-chestnut)....	6, 12, 126, 137, 138
<i>Acacia</i> spp.....	9-11, 20, 22, 27, 113	<i>hippocastanum</i> (horse-chestnut)....	138
<i>arabica</i> (gum arabic).....	9, 10	<i>pavia</i> (red buckeye).....	138
<i>armata</i> (kangaroo thorn).....	9	<i>Agathis australis</i> (kauri).....	195
<i>asak</i>	9	<i>Ak</i> (see <i>Calotropis</i> sp.).	
<i>baileyana</i>	10	<i>Albizia</i> sp.....	211
<i>caffra</i>	10	<i>lophanta</i> (<i>Acacia</i>).....	9
<i>calamifolia</i> (broom wattle).....	9	Alder (see <i>Alnus</i> spp.).	
<i>catechu</i>	10, 211	Alfalfa (see <i>Medicago sativa</i>).	
<i>cyanophylla</i> (blue-leaved wattle).....	9	Algaroba (see <i>Prosopis</i> spp.).	
<i>dealbata</i> (silver wattle).....	10	Alligator pear (see <i>Persea gratissima</i>).	
<i>decurrens</i> (green wattle).....	10, 97	<i>Allium ascalonicum</i> (shalot).....	157, 158
<i>discolor</i>	9, 10	<i>cepa</i> (onions).....	5, 28, 157, 158
<i>farnesiana</i> (huisache).....	10, 11	<i>porrum</i> (leek).....	28, 157
<i>greggii</i> (Texas mimosa).....	10	<i>roseum</i>	158
<i>horrida</i>	10	<i>sativum</i> (garlic).....	28, 157, 158
<i>juniperina</i>	10	<i>sphærocephalum</i>	158
<i>koa</i> (koa).....	10	Almond (see <i>Amygdalis communis</i>).	
<i>linearis</i>	9	Mexican (see <i>Terminalia catappa</i>).	
<i>linifolia</i>	9	Tropical (see <i>Terminalia</i> spp.).	
<i>longifolia</i> (Sydney golden wattle).....	9, 10	<i>Alnus</i> spp. (alder).....	11-13,
<i>lophanta</i> (see <i>Albizia</i>).		65, 107, 108, 138, 150, 151, 221	
<i>melanoxylon</i> (blackwood acacia).....	9	<i>glutinosa</i> (black alder).....	11
<i>microbotrya</i>	9	<i>incana</i>	11, 12
<i>modesta</i>	10, 211	<i>nepalensis</i>	12
<i>mollissima</i> (black wattle).....	10, 97	<i>rubra</i>	11
<i>pendula</i> (weeping myall).....	9, 10	<i>viridis</i> (European green alder).....	11
<i>pulchella</i>	9	<i>Aloe</i> spp.....	160
<i>pycnantha</i> (golden wattle).....	9	<i>Amarantus</i> sp.....	42
<i>robusta</i>	10	<i>Amelanchier</i> spp. (service berry).....	20, 65, 184
<i>suaveolens</i>	10	<i>Amygdalus</i> spp. (peach).....	166, 167

	Page.
<i>Amygdalus communis</i> (almond).....	56, 166, 167
<i>persica</i> (peach).....	85, 92, 109, 113, 114, 115, 117, 129, 166, 167, 177, 179, 214
<i>persica nucipersica</i> (nectarine)...	92, 114
<i>Anacardium occidentale</i> (cashew, wild guava).	109
<i>Ananas sativus</i> (pineapple).....	118, 171, 204
<i>Angelica</i> sp.....	52
<i>Annona</i> spp. (custard apple).....	85, 93, 94
<i>cherimola</i> (cherimoya).....	93, 94, 114
<i>humboldtiana</i>	94, 113
<i>muricata</i> (soursop).....	62, 93, 94, 115
<i>reticulata</i> (custard apple).....	93
<i>squamosa</i> (sugar apple).....	94
<i>Anthocephalus cadamba</i>	62
<i>Apium graveolens</i> (celery).....	52, 53, 215
Apple (see <i>Malus malus</i>).	
black (see <i>Sideroxylon [Achras] australe</i>).	
custard (see <i>Annona squamosa</i>).	
Kei (see <i>Aberia caffra</i>).	
Malay (see <i>Eugenia malaccensis</i>).	
mamee (see <i>Mammea americana</i>).	
mountain (see <i>Eugenia malaccensis</i>).	
rose (see <i>Eugenia jambos</i>).	
star (see <i>Chrysophyllum cainito</i>).	
Apricot (see <i>Prunus armeniaca</i>).	
<i>Araucaria</i> spp.....	25
<i>bidwillii</i>	25
<i>excelsa</i> (Norfolk Island pine).....	25
Arborvitae (see <i>Thuja</i> spp.)	
<i>Arctium</i> sp.....	52
<i>Areca catechu</i> (betel nut).....	44
<i>Areca lutescens</i>	44, 153
<i>Artemisia</i> spp.....	52
<i>vulgaris</i> (mugwort).....	123
<i>Artocarpus integrifolia</i> (jack fruit).....	117
<i>Arundinaria</i> spp. (bamboo).....	31, 32, 33
<i>hindsii graminæ</i>	33
<i>japonica</i>	33
<i>Arundo</i> sp. (reed).....	123
Ash (see <i>Fraxinus</i> spp.).	
mountain (see <i>Sorbus</i> spp.).	
white (<i>Schizomeria ovata</i>).	
Asparagus (see <i>Asparagus officinalis</i>).	
<i>Asparagus acutifolius</i>	29
<i>officinalis</i> (asparagus). 5, 6, 27-29, 129, 157	
<i>umbellatus</i>	29
Aspen (see <i>Populus tremula</i>).	
<i>Aster</i> spp.....	20
<i>Atriplex</i> spp.....	41
<i>hastata</i>	61
<i>hortensis</i> (orache).....	41, 42, 158
<i>patula</i>	184
<i>Atropa belladonna</i> (belladonna).....	115
<i>Avena sativa</i> (oats).....	122, 124, 125, 126, 155
<i>Avicennia carambola</i> (carambola).....	115
Avocado (see <i>Persea gratissima</i>).	
Bahama grass (see <i>Cynodon dactylon</i>).	
Balsam fir (see <i>Abies balsamea</i>).	
Bamboo (see also <i>Arundinaria</i> , <i>Bambusa</i> , <i>Cephalostachyum</i> , <i>Dendrocalamus</i> , <i>Melocanna</i> , <i>Phyllostachys</i>).....	31-33, 143
<i>Bambusa</i> spp. (bamboo).....	31, 32, 33
<i>distorta</i>	33
<i>fortunei</i>	32
<i>oliveriana</i>	33
<i>tessellata</i>	32

	Page.
<i>Bambusa tulda</i>	33
<i>viridis</i>	33
<i>viridi-striata</i>	33
<i>vulgaris</i> (feathery bamboo).....	33
Banana (see <i>Musa sapientium</i>).	
Banyan (see <i>Ficus benghalensis</i>).	
Barbary fig (see <i>Opuntia vulgaris</i>).	
Barley (see <i>Hordeum sativum</i>).	
Basswood (see <i>Tilia</i> spp.).	
<i>Bauhinia racemosa</i> (mountain ebony).....	149
<i>variegata</i>	211
Bay (see <i>Laurus</i> spp.).	
Beans (see also <i>Phaseolus</i> , <i>Vicia</i> , <i>Glycine</i>)....	5, 6, 35-38, 60, 61, 64, 93, 129, 165, 184
Bean, broad (see <i>Vicia faba</i>).	
castor (see <i>Ricinus</i> spp.).	
French.....	38
haricot (see <i>Phaseolus vulgaris</i>).	
jack (see <i>Canavalia</i> spp.).	
kidney (see <i>Phaseolus vulgaris</i>).	
lima (see <i>Phaseolus lunatus</i>).	
Madagascar.....	37
senna (see <i>Cassia</i> spp.).	
soy (see <i>Glycine hispida</i>).	
string (see <i>Phaseolus vulgaris</i>).	
Tonga.....	37
Beech (see <i>Fagus</i> spp.).	
Beet (see <i>Beta vulgaris</i>).	
sugar (see <i>Beta vulgaris crassa</i>).	
Berseem (see <i>Trifolium alexandrinum</i>).	
<i>Beta vulgaris</i> (beet).. 5, 6, 41-44, 129, 187, 197, 214, 219	
(mangel-wurzel).....	41, 42
(mangolds).....	41, 42
<i>crassa</i> (sugar beets).....	41, 42, 43, 197
<i>cicla</i> (Swiss chard).....	42
Betel nut (see <i>Areca catechu</i>).	
<i>Betula</i> spp. (birch).....	6, 45- 47, 107, 108, 138, 150, 151, 152, 177, 221
<i>alba</i>	45, 46
<i>odorata</i>	45, 46
<i>papyrifera</i>	45
<i>pubescens</i>	45
<i>verrucosa</i>	45
Birch (see <i>Betula</i> spp.).	
Black apple (see <i>Sideroxylon [Achras] australe</i>).	
sorrel (see <i>Rubus</i> spp.).	
Blackthorn.....	105, 107, 111
<i>Bombax malabaricum</i> (silk cotton).....	194
Books.....	15
Box (see <i>Buxus</i> spp.).	
Bramble.....	177
<i>Brassica</i> spp.....	48-50, 187
<i>arvensis</i> (charlock).....	92
<i>campestris</i> (rutabaga).....	193, 218
<i>napus</i> (rape).....	49, 91, 135, 187, 188, 218
<i>oleracea acephala</i> (collard).....	48
(kale).....	48, 140, 197
<i>botrytis</i> (cauliflower).....	6, 48, 52
<i>capitata</i> (cabbage).....	5, 6, 48, 49, 50, 61, 64, 91, 184, 187, 188, 214, 218, 219
<i>caulo-rapa</i> (kohl-rabi).....	140
<i>rapa</i> (turnip).....	6, 197, 218, 219
Brazil cherry (see <i>Eugenia brasilensis</i>).	
Bromeliaceæ.....	202
Broom corn (<i>Holcus sorghum</i>).	
Brussels sprouts (see <i>Brassica oleracea</i>).	

	Page.		Page.
<i>Bryobia dioica</i> (bryony).....	92	<i>Cestrum</i> sp. (Chinese inkberry).....	115
Buckeye (see <i>Aesculus</i> spp.).		<i>nocturnum</i> (night-blooming jessa-	
Buckthorn (see <i>Rhamnus</i> spp.).		mine).....	56
Bull-oak (see <i>Casuarina</i> spp.).		<i>Chamaecyparis</i> spp. (cedar).....	94
Bunch cherry.....	108	<i>nutkaensis</i>	94
Bushes.....	110	<i>obtusata</i>	94
Butternut (see <i>Juglans cinerea</i>).		<i>pisifera</i>	94
Buttonwood (see <i>Platanus</i> spp.).		Chard (see <i>Beta vulgaris cicla</i>).	
<i>Butyrospermum parkii</i>	116	Swiss (see <i>Beta vulgaris cicla</i>).	
<i>Buxus</i> spp. (box).....	5, 48	Charloek (see <i>Brassica arvensis</i>).	
Cabbage (see <i>Brassicae oleracea capitata</i>).		Cheesewood (see <i>Acronychia laevis</i>).	
Cabuyao (see <i>Eugenia malaccensis</i>).		Chenopodiaceæ.....	42
Cacao (see <i>Theobroma cacao</i>).		<i>Chenopodium</i> spp. (goosefoot).....	41, 42
<i>Cajanus indicus</i> (pigeon pea, tur).....	36, 37	Cherimoya (see <i>Annona cherimola</i>).	
<i>Calamagrotis lanceolata</i>	124	Cherry (see <i>Prunus</i> spp.)	
<i>Calamus</i> spp. (rattan).....	188	Jerusalem (see <i>Solanum capsicastrum</i>).	
<i>Calophyllum inophyllum</i> (round kamani)....	115	sour (see <i>Prunus cerasus</i>).	
<i>Calotropis</i> sp.....	117	Surinam (see <i>Eugenia uniflora</i>).	
<i>Camellia thea</i> (see <i>Thea sinensis</i>).		Chestnut (see <i>Castanea</i> spp.)	
<i>Canavalia</i> spp. (Jack bean).....	37	Chicory (see <i>Cichorium intybus</i>).	
<i>indica</i>	85	China berry (see <i>Melia azedarach</i>).	
Cane.....	131	Chinese inkberry (see <i>Cestrum</i> sp.)	
sugar (see <i>Saccharum officinale</i>).		orange (see <i>Citrus japonica</i>).	
<i>Cannabis sativa</i> (hemp).....	123, 135	plum (see <i>Noronia emarginata</i>).	
Canteloupe (see <i>Cucumis melo</i>).		Chocolate ((see <i>Theobroma</i> spp.).	
Caoutchoue (see also rubber).....	50	<i>Chrysanthemum</i> spp.....	215
Cape weed.....	215	<i>Chrysobalanus</i> spp.....	116
<i>Capparis pedunculosa</i>	56	<i>ellipticus</i>	115, 116, 139
<i>roxburghii</i>	56	<i>icaco</i> (Cocoa plum, jicaco).....	109,
<i>Capsicum</i> sp. (pepper).....	115	115, 139	
<i>Carica papaya</i> (papaya, pawpaw)... 85, 115, 163, 201		<i>Chrysophyllum cainito</i> (Star apple).....	115
<i>quercifolia</i>	115, 163	<i>Cichorium intybus</i> (chicory).....	54
<i>Carissa arduina</i> (Natal plum).....	115	<i>Cinchona</i> spp. (quinine).....	55, 62, 211
<i>diffusa</i>	211	<i>Cinchona ledgeriana</i>	55, 62
<i>Carpinus betulus</i>	106, 107, 108, 137	<i>Cineraria</i> spp.....	215
Carrots (see <i>Daucus carota</i>).		<i>Citrullus citrullus</i> (watermelon).....	220
<i>Carum petroselinum</i> (parsley).....	164	<i>Citrus</i> spp.....	5, 55-60, 97, 114, 117, 162, 191, 212
<i>Caryota urens</i> (wine palm).....	201	<i>aurantium</i> or <i>sinensis</i> (orange).....	5, 15,
Cashew (see <i>Anacardium occidentale</i>).		55, 56, 57, 58, 59, 60, 85,	
Cassava (see <i>Manihot utilisima</i>).		97, 113, 114, 115, 117, 200	
<i>Cassia</i> spp. (senna bean).....	85	<i>decumana</i> (see <i>Citrus grandis</i>).	
<i>auriculata</i>	211	<i>grandis</i> (grapefruit).....	55, 60, 115
<i>Castanea</i> spp. (chestnut).....	38, 53, 54, 105	(pomelo).....	57
<i>vesca</i>	54	(shaddock).....	117, 118
<i>vulgaris</i>	54, 152	<i>japonica</i> (kumquat).....	55, 60, 115
<i>Castilleja elastica</i> (Panama rubber).....	163	<i>aurantifolia</i> (lime)... 55, 57, 59, 60, 114, 117, 200	
Castor bean (see <i>Ricinus</i> spp.).		<i>limonia</i> (lemon).....	5, 55, 57, 59, 60, 115, 117
<i>Casuarina</i> spp. (She-oak).....	97	<i>medica acida</i>	59
Catalpa (see <i>Catalpa</i> spp.).		<i>nobilis deliciosa</i> (mandarin orange)... 57,	
<i>Catalpa</i> spp. (Catalpa).....	5, 51	58, 60, 115	
Cauliflower (see <i>Brassica oleracea botrytis</i>).		(tangerine).....	58, 59
Cayenne cherry (see <i>Eugenia uniflora</i>).		<i>trifoliata</i> (see <i>Poncirus</i>).	
Ceara rubber (see <i>Manihot glaziovii</i>).		Clover (see <i>Trifolium</i> spp.).	
Cedar (see <i>Cedrus</i> spp., <i>Chamaecyparis</i> spp.).		Egyptian (see <i>Trifolium alexandrinum</i>).	
red (see <i>Juniperus</i> spp.).		Cobnut (see <i>Corylus</i> spp.).	
white (see <i>Cedrus</i> spp.).		Cobs.....	108
<i>Cedrela toona</i>	218	<i>Coccoloba uvifera</i> (sea-grape).....	109
<i>Cedrus</i> spp.....	52	Cocoa plum (see <i>Chrysobalanus icaco</i>).	
sp. (white cedar).....	52	Coconut palm (see <i>Cocos nucifera</i>).	
<i>deodara</i>	52	<i>Cocos nucifera</i> (coconut palm).....	5, 61, 109,
<i>Ceiba</i> spp. (silk cotton).....	50	159, 160, 161, 162, 163, 201, 202	
<i>bombaxi</i> (kapok).....	194	<i>Coffea</i> sp.....	50, 56, 59, 61-64, 113, 116, 211
Celery (see <i>Apium graveolens</i>).		<i>arabica</i> (Arabian coffee).....	61, 62, 63, 64, 115
<i>Cephalostachyum pergracile</i> (bamboo).....	31, 33	<i>liberica</i> (Liberian coffee).....	61, 62, 63, 109

	Page.		Page.
<i>Coffea robusta</i>	62	<i>Dendrocalamus giganteus</i> (bamboo).....	33
<i>stenophylla</i>	64	<i>hamiltoni</i>	33
Coffee (see <i>Coffea</i> spp.).		<i>strictus</i>	31, 33
Cola (see <i>Sterculia acuminata</i>).		Deodar (see <i>Cedrus deodara</i>).	
Collard (see <i>Brassica oleracea acephala</i>).		<i>Diospyros</i> spp. (persimmon).....	170
Conifers	6, 64-84, 170, 210	<i>ebenum</i>	170
<i>Convallaria majalis</i> (Lily-of-the-Valley).....	28	<i>kaki</i> (Japanese persimmon)..<	113, 115, 170
<i>Conyza squarrosa</i>	123	<i>Dodonea viscosa</i>	211
Corn (see <i>Zea mays</i>).		Dogwood (see <i>Cornus</i> spp.).	
broom (see <i>Holcus sorghum</i>).		<i>Dolichos</i> spp.....	36
Guinea (see <i>Holcus sorghum</i>).		Drugs.....	84
Indian (see <i>Zea mays</i>).		Dry food products.....	84
Kafir (see <i>Holcus sorghum</i>).		<i>Durantha</i> spp.....	62
<i>Cornus</i> spp. (dogwoods).....	95	Durra (see <i>Holcus sorghum</i>).	
<i>sanguinea</i>	95	Ebony, mountain (see <i>Bauhinia racemosa</i>).	
<i>sericea</i>	95	Eggplant (see <i>Solanum melongena</i>).	
<i>Corylus</i> spp. (filberts).....	108, 133	Elengi tree (see <i>Mimusops elengi</i>).	
(hazelnut). 38, 107, 108, 133-135, 151, 175		Elm (see <i>Ulmus</i> spp.).	
<i>avellana</i>	45, 133, 134	cork (see <i>Ulmus</i> sp.).	
<i>colurna</i>	134	Emmer (see <i>Triticum</i> spp.).	
<i>tubulosa</i>	133	<i>Epilobium</i> spp.....	127
<i>Cosmos</i> spp.....	215	<i>Eriobotrya japonica</i> (loquat).....	85, 112, 114, 115, 142
Cowpea (see <i>Vigna unguiculata</i>).		<i>Erythrina lithosperma</i> (coral tree).....	62
Cotton (see <i>Gossypium</i> spp.).		<i>Eucalyptus</i> spp.....	15, 20, 97-100
silk (see <i>Bombax malabaricum</i>).		<i>amygdalina</i> (peppermint gum)...	98
(see <i>Ceiba</i> spp.).		<i>capitellata</i>	99
Cottonwood (see <i>Populus</i> spp.).		<i>corymbosa</i> (bloodwood).....	99
<i>Cratægus</i> spp. (see <i>Mespilus</i> spp.).		<i>diversicolor</i> (karri).....	99
<i>Crotalaria</i> spp.....	37, 165	<i>dumosa</i>	98
Crucifers.....	6, 91, 92, 188, 218, 219	<i>globulus</i> (blue gum).....	98, 99
Cucumber (see <i>Cucumis sativus</i>).		<i>gracilis</i>	99
<i>Cucumis</i> spp. (melons).....	5, 92, 93	<i>hæmastoma</i>	98, 99
(sweet melons).....	92	<i>incrassata</i>	99
<i>melo</i> (cantaloupe, muskmelon)....	51, 150	<i>leucorylon</i>	99
<i>sativus</i> (cucumber).....	42, 92, 114	<i>melliodora</i> (honey-scented gum). 98, 99	
(gherkins).....	93, 129	<i>miniata</i>	98
<i>Cucurbita</i> spp. (gourds).....	92, 122	<i>oleosa</i>	98
<i>maxima</i> (squash).....	93	<i>patens</i>	98
<i>pepo</i> (pumpkin).....	92	<i>piperita</i> (peppermint stringy-	
<i>ovifera</i> (marrow).....	92	bark).....	99
Cucurbitaceæ.....	92, 93, 117, 183, 220	<i>polyanthemus</i>	99
<i>Cupressus</i> spp. (cypress).....	94	<i>resinifera</i>	99
<i>funbris</i>	94	<i>robusta</i> (swamp mahogany).....	99
<i>glauca</i>	94	<i>rostrata</i> (red gum).....	98, 99
<i>lambertiana</i>	64, 94	<i>siderophloia</i> (broad-leaved iron-	
<i>macrocarpa</i> (Monterey cypress)...	94	bark).....	99
<i>pyramidalis</i>	94	<i>sieberiana</i>	99
<i>sempervirens</i>	94	<i>stuartiana</i> (apple-scented gum)..<	97, 98
Currant (see <i>Ribes</i> spp.).		<i>tessellaris</i>	99
Custard apple (see <i>Annona</i> spp.).		<i>uncinata</i>	98, 99
<i>Cycas revoluta</i> (sago palm).....	5, 159, 162, 193, 201	<i>viminalis</i> (manna gum).....	97, 98, 99
<i>Cydonia japonica</i>	186	<i>Eugenia</i> spp.....	100, 113
<i>oblonga</i> (quince)....	17, 19, 114, 115, 186, 187	<i>braziliensis</i>	100, 115
<i>Cynodon dactylon</i> (Bermuda grass).....	200	<i>jambos</i> (rose-apple).....	100, 115
Cypress (see <i>Chamæcyparis</i> spp., <i>Cupressus</i> spp.).		<i>malaccensis</i> (Cabuyao, Malay apple,	
Lambert's (see <i>Cupressus lambert-</i>		mountain apple).....	57, 100, 115, 117
<i>iana</i>).		<i>uniflora</i> (Surinam cherry).....	100, 115, 116
<i>Cytisus laburnum</i>	36	<i>Euxolus</i> sp.....	42
Daffodil (see <i>Narcissus</i> spp.).		Evergreen trees (see also Conifers).....	131
<i>Dahlia</i> spp.....	85, 215	<i>Evonymus europæus</i> (spindle tree).....	108, 138
<i>Dalbergia sissoo</i> (sisso).....	195	Excrement, human.....	157
<i>Dammara</i> spp. (see <i>Agathis australis</i>).		<i>Fagus</i> spp. (beech).....	6, 38-40,
Dandelion (see <i>Taraxacum officinale</i>).		46, 65, 107, 108, 138, 150, 151, 180, 221	
Date (see <i>Phœnix dactylifera</i>).		<i>cliffortioides</i>	39
<i>Daucus carota</i> (carrot).....	51, 214, 215	<i>fusca</i>	39

	Page.		Page.
<i>Fagus menziesii</i>	39	Gourd (see <i>Cucurbita</i> spp.).	
<i>sylvatica</i> (European beech).....	39, 40	Grains	7, 122-126, 189, 190, 193, 213, 214
Ferns.....	197	Granadilla (see <i>Passiflora quadrangularis</i>).	
<i>Ficus</i> spp. (fig, rubber).....	100-103, 172, 192	Graminaceæ (see "Grains" and "Grasses").	
<i>altissima</i>	103	Grape (see <i>Vitis</i> spp.).	
<i>australis</i>	101	Grapefruit (see <i>Citrus grandis</i>).	
<i>benghalensis</i> (banyan).....	100, 102	Grass	61, 109, 122-126, 193, 197, 199, 203, 206, 213
<i>bergmanniana</i>	103	Bahama (see <i>Cynodon dactylon</i>).	
<i>carica</i> (fig.).....	5, 100, 101, 102, 103, 115	Greenhouse plants.....	65
<i>caudatifolia</i>	102	<i>Grevillea</i> sp.....	62
<i>comosa</i>	103	<i>robusta</i> (silky oak).....	194, 195
<i>cordifolia</i>	103	Guava (see <i>Psidium</i> spp.).	
<i>cunia</i>	103	strawberry (see <i>Psidium cattleianum</i>).	
<i>elastica</i> (Assam rubber).....	29, 100, 102, 103	wild (see <i>Anacardium occidentale</i>).	
<i>glomerata</i> (cluster fig).....	102, 103	<i>Guaiacum officinale</i>	56
<i>indica</i>	102, 103	Guinea corn (see <i>Holcus sorghum</i>).	
<i>infectoria</i>	102, 103	Gum (see <i>Eucalyptus</i> spp.).	
<i>laccifera</i>	103	Hard woods.....	66
<i>macrophylla</i> (Moreton Bay fig)	101, 102	Hawthorn (see <i>Mespilus</i> spp.).	
<i>nervosa</i>	103	Hazel (see <i>Corylus</i> spp.).	
<i>nota</i>	102	<i>Helianthus</i> spp. (sunflower).....	85, 215
<i>obtusifolia</i>	103	Hemp (see <i>Cannabis sativa</i>).	
<i>orbicularis</i>	102	sann (see <i>Crotalaria</i> sp.).	
<i>palmata</i>	103	Hemlock spruce (see <i>Tsuga</i> spp.).	
<i>religiosa</i> (peepul tree).....	102, 103	Henbane (see <i>Hyoscyamus niger</i>).	
<i>retusa</i>	102	<i>Heracleum</i> spp.....	52
<i>roxburghii</i>	103	Herbs.....	66, 109
<i>rubiginosa</i>	103	<i>Herpephyllum caffrum</i> (Kaffir plum).....	115
<i>rumphii</i>	103	<i>Hevea brasiliensis</i> (Para rubber).....	62, 164, 192
<i>scandens</i>	102	<i>Hibiscus esculentus</i> (okra).....	50, 86, 155
<i>tjakela</i>	103	<i>Holcus sorghum</i> (durra).....	95, 195, 196, 203
<i>walkeriana</i>	102	(Guinea corn).....	200
Fig (see <i>Ficus carica</i>).		(Kafir).....	140, 195
Barbary (see <i>Opuntia vulgaris</i>).....	185	(sorghum, broom corn).....	36, 48, 95, 189, 195, 196, 203, 208
Filbert (see <i>Corylus</i> spp.).		Honeysuckle (see <i>Lonicera</i> spp.).	
<i>Firmiana colorata</i>	62	Hops (see <i>Humulus lupulus</i>).	
Fir (see <i>Abies</i> spp.).		<i>Hordeum vulgare</i> (barley).....	35
balsam (see <i>Abies balsamea</i>).		122, 123, 124, 125, 126, 187
Douglas (see <i>Pseudotsuga taxifolia</i>).		Hornbeam (see <i>Carpinus betulus</i>).	
silver (see <i>Abies pectinata</i>).		Horse-chestnut (see <i>Æsculus</i> spp.).	
white (see <i>Abies pectinata</i>).		Horse-radish (see <i>Radicula armoracia</i>).	
Flax (see <i>Linum usitatissimum</i>).		<i>Humulus lupulus</i> (hops).....	5,
Flour.....	122	91, 123, 129, 135-137, 214
Forests.....	104-108, 127	<i>Hyoscyamus niger</i> (henbane).....	42
<i>Fragaria</i> spp. (strawberry).....	65, 129, 196, 197	<i>Ipomœa batatas</i> (sweet potato).....	200, 209, 210
<i>Fraxinus</i> spp. (ash).....	25, 27, 65, 138, 151, 180, 221	Ire (see <i>Funtumia elastica</i>).	
<i>excelsior</i>	26	<i>Iris</i> spp.....	139, 157
<i>ornus</i>	25	Jaboticaba (see <i>Myrciaria</i> spp.).	
<i>oxyphylla</i>	26	Japanese plum (see <i>Prunus salicina</i>).	
<i>viridis</i>	26	Jerusalem cherry (see <i>Solanum capsicastrum</i>).	
French beans.....	37	Jicaco (see <i>Chrysobalanus icaco</i>).	
Fruits.....	93, 105, 106, 108-118, 119, 129, 172, 174	Jobo amarillo (<i>Spondias</i> sp.).....	113
cultivated.....	116, 172	Jobo de la India (<i>Spondias mangifera</i> ?).....	113
deciduous.....	108, 114	<i>Juglans</i> spp. (walnuts).....	38,
stone.....	110	53, 105, 133, 134, 151, 180, 219, 220, 221
<i>Funtumia</i> spp.....	50, 195	<i>cinerea</i> (butternut).....	219, 220
<i>elastica</i> (silk rubber, ire)	195	<i>nigra</i> (black walnut).....	220
Furniture.....	15	<i>regia</i> (English walnut).....	45, 220
<i>Galega officinalis</i> (Goat's rue).....	60	Juniper (see <i>Juniperus</i> spp.).	
Garlic (see <i>Allium sativum</i>).		<i>Juniperus</i> spp.....	67, 139, 140
<i>Geranium</i> spp.....	15, 215	<i>canadensis</i>	139
Gherkins (see <i>Cucumis sativus</i>).		<i>cedrus</i>	139
<i>Glycine hispida</i>	196	<i>chinensis</i>	139
Gooseberry (see <i>Ribes</i> spp.).		<i>communis</i>	139, 140
Goosefoot (see <i>Chenopodium</i> spp.).		<i>drupacea</i>	139
<i>Gossypium</i> spp. (cotton).....	59, 62, 84, 86-91, 191		

	Page.		Page.
<i>Juniperus excelsa</i>	139	Maize (see <i>Zea mays</i>).	
<i>foetidissima</i>	139	Malay apple (see <i>Eugenia malaccensis</i>).	
<i>macrocarpa</i>	139	<i>Malus malus</i> (apple).....	6, 15-24, 85, 105, 106, 111, 113, 114, 115, 129, 167, 173, 174, 175, 180
<i>oxycedrus</i>	139	<i>Mammea americana</i> (mammee apple).....	115, 118, 142
<i>phœnicea</i>	139	Mammee apple (see <i>Mammea americana</i>).	
<i>recurva</i>	139	Mandarin (see <i>Citrus nobilis</i>).	
<i>sabina</i>	139	Mangel-wurzel (see <i>Beta vulgaris</i>).	
<i>sphærica</i>	139	Mango (see <i>Mangifera indica</i>).	
<i>torulosa</i>	139	<i>Mangifera indica</i> (mango).....	5, 50, 109, 113, 114, 115, 117, 142-147, 158, 200
<i>virginiana</i>	139	Mangold (see <i>Beta vulgaris</i>).	
Kafir (see <i>Holcus sorghum</i>).		<i>Manihot glaziovii</i> (Ceara rubber).....	51, 192
Kaffir plum (see <i>Herpephyllum caffrum</i>).		<i>utilissima</i> (cassava, tapioca).....	51
Kale (see <i>Brassica oleracea acephala</i>).		Maple (see <i>Acer</i> spp.).	
Kamani, round (see <i>Calophyllum inophyl-</i>		Marigold.....	215
<i>lum</i>).		Marrow (see <i>Cucurbita pepo ovifera</i>).	
winged (see <i>Terminalia catappa</i>).		<i>Medicago sativa</i> (alfalfa).....	6, 13-15, 61
Kauri (see <i>Agathis australis</i>).		(lucerne).....	14, 60, 61, 129
Kei, apple (see <i>Aberia caffra</i>).		<i>falcata</i>	13
<i>Kickxia</i> spp. (see <i>Funtumia</i> spp.).		Medlar (see <i>Mespilus</i> spp.).	
Kohl-rabi (see <i>Brassica oleracea caulorapa</i>).		<i>Melaleuca</i> sp.....	97
Kola (see <i>Sterculia acuminata</i>).		<i>Melia azedarach</i> (Chinaberry).....	54, 55, 62, 84
Kumquat (see <i>Citrus japonica</i>).		<i>Melilotus officinalis</i> (melilotus).....	61
<i>Kurrimia zeylanica</i>	56	<i>Melocanna bambusoides</i> (bamboo).....	31, 33
<i>Lactuca</i> spp. (lettuce).....	140, 141, 214, 215	Melons (see <i>Cucumis</i> spp.).	
Lambsquarter (<i>Chenopodium</i> or <i>Atriplex</i>)....	41	<i>Mespilus</i> spp. (hawthorn).....	5, 17, 106, 107, 111, 132, 133, 175, 177
Larch (see <i>Larix</i> spp.).		(white thorn).....	105, 121, 169
<i>Larix</i> spp. (Larch).....	64, 65, 66, 67, 68, 69, 70, 83, 84, 108, 140	<i>coccinea</i>	132
<i>decidua</i> (europaea).....	70, 82, 83, 140	<i>germanica</i> (medlar).....	17, 115, 132
<i>europæa</i> (see <i>Larix decidua</i>).		<i>heterophylla</i>	132
<i>Lathyrus</i> spp.....	36	<i>monogyna</i>	132
<i>Laurus</i> spp. (bay).....	35	<i>oxyacantha</i>	132
<i>camphora</i> (camphor).....	35	<i>pyracantha</i>	132
<i>canariensis</i>	35	Mesquite (see <i>Prosopis</i> spp.).	
<i>drymifolia</i> (see <i>Persea persca</i>).		Mexican almond (see <i>Terminalia catappa</i>).	
<i>indicus</i>	35	umbrella tree (see <i>Terminalia</i>	
<i>nobilis</i> (sweet bay).....	35	<i>catappa</i>).	
Leather.....	5	Millet (see <i>Panicum miliaceum</i>).	
Leek (see <i>Allium porrum</i>).		<i>Mimusops elengi</i> (elengi).....	115
Legumes.....	165	Mock orange (see <i>Murraya exotica</i>).	
<i>Lemna</i> spp.....	220	<i>Morus</i> sp. (mulberry).....	56, 150
Lemon (see <i>Citrus limonia</i>).		<i>indica</i>	150
<i>Lens esculenta</i> (lentil).....	36, 165	Moth (see <i>Phaseolus aconitifolius</i>).....	37
Lentil (see <i>Lens esculenta</i>).		Mountain apple (see <i>Eugenia malaccensis</i>).	
<i>Leptospermum</i> spp.....	97	ash (see <i>Sorbus</i> spp.).	
Lettuce (see <i>Lactuca</i> spp.).		ebony (see <i>Bauhinia racemosa</i>).	
<i>Ligusticum</i> spp.....	52	Mulberry (see <i>Morus</i> spp.).	
<i>Ligustrum vulgare</i> (privet).....	89	Mung (see <i>Phaseolus mung</i>).	
Lilies.....	183	<i>Murraya exotica</i> (mock orange).....	115
Lily of the Valley (see <i>Convallaria majalis</i>).		<i>Musa</i> spp. (banana, plantain).....	33, 115, 172
Lime (see <i>Citrus aurantifolia</i> ; <i>Tilia</i> spp.).		<i>paradisiaca</i>	33
sweet (see <i>Citrus aurantifolia</i>).		<i>sapientium</i> (banana).....	33, 34, 85, 109, 114, 118, 201, 202, 204
Linden (see <i>Tilia</i> spp.).		Muskmelon (see <i>Cucumis melo</i>).	
<i>Linum</i> spp.....	104	Mustard (see <i>Sinapis</i> spp.).	
<i>usitatissimum</i> (flax).....	103, 104	<i>Myrciaria</i> spp. (jaboticaba).....	56
<i>Lippia citriodora</i> (lemon verbena).....	56	<i>Myrtus</i> spp.....	56
<i>Livistona humulis</i> (palm).....	162	<i>Narcissus</i> spp.....	150
Loganberry (see <i>Rubus</i> spp.).		Nasturtium (see <i>Tropæolum</i> spp.).	
<i>Lonicera</i> spp. (honeysuckle).....	129, 177	Natal plum (see <i>Carissa arduina</i>).	
Loquat (see <i>Eriobotrya japonica</i>).		Nectarine (see <i>Amygdalis persica nusipersica</i>).	
<i>Lotus</i> spp.....	36	<i>Nephelium lappaceum</i>	50
Lucerne (see <i>Medicago sativa</i>).		<i>Nicotiana tabacum</i> (tobacco).....	41, 59, 95, 198, 207, 213-216, 217
<i>Lycopersicum esculentum</i> (tomato).....	62, 93, 95, 115, 216, 217		
Madagascar beans.....	37		
Mahogany (see <i>Swietenia mahogani</i>).			

	Page.		Page.
<i>Noronia emarginata</i> (Chinese plum).....	115	<i>Persea gratissima</i> (avocado).....	6,
Nettle, stinging.....	135	29, 30, 56, 62, 109, 115, 200	
Nursery stock.....	119	<i>persea</i> (<i>Laurus drymifolia</i>).....	30
Nuts.....	17, 108, 219	<i>pittieri</i>	30
Oak (see <i>Quercus</i> spp.).....	5	Persimmon (see <i>Diospyros</i> spp.).	
cork.....	151	Japanese (see <i>Diospyros kaki</i>).	
silky (see <i>Grevillea robusta</i>).		<i>Phaseolus aconitifolius</i> (moth).....	37
Oats (see <i>Avena sativa</i>).		<i>lunatus</i> (lima bean).....	35, 37
Okra (see <i>Hibiscus esculentus</i>).		<i>mungo</i> (mung).....	37
<i>Olea</i> spp.....	26, 27, 127, 155-157, 212	<i>radiatus</i>	36
<i>chrysophylla</i>	156	<i>vulgaris</i> (bean).....	35-38, 60, 61, 115
<i>europæa</i> (olive).....	155, 156	(haricot).....	38
<i>fragrans</i> (see <i>Osmanthus</i>).		(kidney bean).....	38
<i>verrucosa</i>	156	<i>Phleum pratense</i> (timothy).....	122, 126, 213
Olive (see <i>Olea</i> spp.).		<i>Phoenix dactylifera</i> (date palm)..	94, 159, 161, 162, 163
Onion (see <i>Allium cepa</i>).		<i>sylvestris</i> (toddy palm).....	159, 161, 217
<i>Onobrychis sativa</i> (sainfoin).....	66	<i>Photinia</i> spp.....	62
<i>Ononis</i> spp.....	61	<i>Phyllostachys</i> spp. (bamboo).....	31, 32
<i>viscosa</i>	61	<i>bambusoides</i>	32
<i>Opuntia</i> spp. (prickly pear).....	185, 186	<i>Phylocalyx</i> sp.....	113
<i>tuna</i>	115, 185, 186	<i>Picea</i> spp. (spruce).....	64, 65, 66,
<i>vulgaris</i> (Barbary fig).....	115, 185, 186	67, 68, 69, 70, 79-82, 103, 108, 129, 196	
Orache (see <i>Atriplex hortensis</i>).		(Siberian spruce).....	69
Orange (see <i>Citrus aurantium</i>).		<i>alba</i> . (white spruce).....	81, 108
mandarin (see <i>Citrus nobilis</i>).		<i>excelsa</i> (Norway spruce). 67, 68, 69, 70, 79, 80, 81	
mock (see <i>Murraya exotica</i>).		<i>morinda</i>	68, 69, 70, 81, 82
Orehard trees (see also fruits).....	110, 112	<i>omorica</i>	81
Orchids.....	5, 158, 159, 183, 202	<i>orientalis</i>	67
<i>Oreodoxa regia</i> (royal palm).....	159, 192, 201	<i>pungens</i> (Colorado spruce).....	81
<i>Orobis tuberosus</i>	165	<i>sitchensis</i> (Sitka spruce).....	80, 81
<i>Oryza sativa</i> (rice).....	122, 123, 189-191, 203, 207	Pine (see <i>Pinus</i> spp.).	
<i>Osmanthus fragrans</i>	156	Aleppo (see <i>Pinus halepensis</i>).	
Palm.....	59, 159-163, 188, 204, 212, 217	Murray (see <i>Pinus frenela</i>).	
coconut (see <i>Cocos nucifera</i>).		Siberian stone (see <i>Pinus cembra</i>).	
date (see <i>Phoenix dactylifera</i>).		Scotch (see <i>Pinus sylvestris</i>).	
royal (see <i>Oreodoxa regia</i>).		Weymouth (see <i>Pinus strobus</i>).	
sago (see <i>Cycas revoluta</i>).		Pineapple (see <i>Ananas sativus</i>).	
toddy (see <i>Phoenix sylvestris</i>).		<i>Pinus</i> spp. (pine).....	45,
wine (see <i>Caryota urens</i>).		64, 65, 66, 68, 69, 70-77, 108, 129, 150, 170	
<i>Pandanus</i> sp.....	115, 204	<i>austriaca</i> (Austrian pine).....	69, 73, 74
<i>odoratissimus</i> (screw pine).....	163	<i>cembra</i> (Swiss stone pine).....	67, 69, 73
<i>Panicum</i> sp.....	122	<i>densiflora</i> (Japanese red pine).....	73
<i>miliacum</i> (millet). 85, 122, 123, 126, 149, 203		<i>excelsa</i>	68, 69, 70, 73, 74, 75
<i>sanguinale</i>	123	<i>filifolia</i>	73
Papaya (see <i>Carica papaya</i>).		<i>frenela</i> (Murray pine).....	64
Para plum (see <i>Spondias</i> spp.).		<i>gerardiana</i>	69, 73, 74, 75
rubber (see <i>Hevea brasiliensis</i>).		<i>halepensis</i> (Aleppo pine).....	72, 74
Parsley (see <i>Carum petroselinum</i>).		<i>khasya</i>	74
Parsnips (see <i>Pastinaca sativa</i>).		<i>laricio</i> (Austrian pine).....	72, 73, 76
<i>Passiflora</i> sp. (passion fruit).....	116	<i>laricio nigricans</i>	72
<i>quadrangularis</i> (granadilla).....	85,	<i>longifolia</i>	69, 73, 74, 75, 76, 211
	115, 117, 118, 126	<i>maritima</i> (cluster pine).....	69
Passion fruit (see <i>Passiflora</i> sp.).		<i>montana</i> (Swiss mountain pine). 67, 70, 72, 74	
<i>Pastinaca sativa</i> (parsnips).....	52, 164, 183, 215	<i>mughus</i>	70
Pawpaw (see <i>Carica papaya</i>).		<i>pinea</i> (stone pine).....	69, 76
Pea (see <i>Pisum sativum</i>).		<i>pinaster</i> (cluster pine).....	69, 73, 75, 76
field.....	165	<i>pumilio</i>	73
pigeon (see <i>Cajanus indicus</i>).		<i>resinosa</i> (red pine).....	72
Peach (see <i>Amygdalis persica</i>).		<i>sylvestris</i> (Scotch pine).....	65,
Pear (see <i>Pyrus communis</i>).		66, 67, 69, 70, 72, 73, 74, 75, 221	
alligator (see <i>Avocado</i> spp.).		<i>strobus</i> (white pine, Weymouth pine). 65,	
prickly (see <i>Opuntia tuna</i>).		67, 69, 72, 75	
<i>Pennisetum</i> spp.....	189	<i>thunbergii</i> (Japanese black pine).....	73
Peppers, Spanish.....	183	Pistachio (see <i>Pistacia</i> spp.).	
<i>Persea americana</i>	30	<i>Pistacia</i> spp. (pistachio).....	157, 171
<i>carolinensis</i> (red bay).....	30	<i>lentiscus</i>	171

- | | Page. | | Page. | |
|--|--|---|--|-----|
| <i>Pistacia terebinthus</i> | 171 | <i>Psidium cattleianum</i> (strawberry guava)... | 115, 132 | |
| <i>vera</i> (pistachio)..... | 171 | <i>guajava</i> (guava)..... | 109, 113, 115, 131, 132 | |
| <i>Pisum sativum</i> (pea)..... | 5, | <i>pomiferum</i> | 131 | |
| | 6, 36, 37, 60, <u>164</u> , 165, 196, 197, 214, 215 | Pumpkin (see <i>Cucurbita pepo</i>). | | |
| Plane tree (see <i>Platanus</i> spp.). | | <i>Punica granatum</i> (pomegranate)..... | 112, <u>180</u> | |
| <i>Plantago lanceolata</i> | 184 | Purslane (see <i>Portulaca oleracea</i>)..... | 186 | |
| Plantain (see <i>Musa</i> spp.; <i>Plantago</i> spp.). | | <i>Pyrus communis</i> (pear)..... | 5, 7, 17, | |
| <i>Platanus</i> spp. (buttonwood, sycamore)..... | 171 | | 18, 19, 24, 105, 111, 113, 115, 129, 167-170, 174, 177 | |
| <i>orientalis</i> (oriental plane)..... | 171 | <i>Quercus</i> spp. (oak)..... | 5, 12, 17, 27, 38, 53, | |
| Plum (see <i>Prunus</i> spp.). | | | 105, 106, 107, 108, 110, 121, 126, | |
| Japanese (see <i>Prunus salicina</i>). | | | 127, 129, 133, 138, <u>150-155</u> , 221 | |
| Kafir (see <i>Herpephyllum caffrum</i>). | | (cork oak)..... | 151 | |
| Natal (see <i>Carissa arduina</i>). | | <i>branti</i> | 153 | |
| Para (see <i>Spondias</i> spp.). | | <i>castaneifolia</i> | 153 | |
| <i>Polygonum</i> spp..... | 41 | <i>cerris</i> | 152, 153 | |
| Pomegranate (see <i>Punica granatum</i>). | | <i>coccifera</i> | 152, 153 | |
| Pomelo (see <i>Citrus grandis</i>). | | <i>dilatata</i> | 153, 154 | |
| <i>Poncirus trifoliata</i> (trifoliate orange)..... | 59 | <i>griffithii</i> | 153 | |
| Poplar (see <i>Populus</i> spp.). | | <i>ilex</i> (holly oak)..... | 152, 153 | |
| <i>Populus</i> spp. (poplar)..... | 12, | <i>ilex ballota</i> | 153 | |
| | 106, 107, 108, 138, <u>180-183</u> , 221 | <i>incana</i> | 153, 154 | |
| <i>alba</i> (white poplar)..... | 181, 182, <u>221</u> , 222 | <i>lamellosa</i> | 154 | |
| <i>balsamifera</i> (balsam poplar)..... | 181 | <i>lusitanica</i> | 152 | |
| <i>canadensis</i> | 180 | <i>macedonica</i> | 152, 153 | |
| <i>ciliata</i> | 181 | <i>montana</i> (chestnut oak)..... | 152 | |
| <i>dilatata</i> | 181 | <i>nigra</i> | 152 | |
| <i>euphratica</i> | 180, 181 | <i>palustris</i> | 152, 153 | |
| <i>laurifolia</i> | 181, 221 | <i>pedunculata</i> | 152, 153 | |
| <i>monilifera</i> | 181 | <i>prinus</i> | 153 | |
| <i>nigra</i> (black poplar)..... | 180, 181 | <i>pubescens</i> | 152, 153 | |
| <i>tremula</i> (aspen)..... | 29, 150, 180, 181 | <i>robur</i> (English oak)..... | 152, 153, 154 | |
| <i>virginiana</i> | 181 | <i>semicarpifolia</i> | 153 | |
| <i>Portulaca oleracea</i> (purslane)..... | 42, <u>186</u> | <i>sessiliflora</i> | 127, 152, 153 | |
| Potato (see <i>Solanum tuberosum</i>). | | <i>suber</i> (cork oak)..... | 152, 153 | |
| sweet (see <i>Ipomœa batatas</i>). • | | <i>toza</i> | 153 | |
| Prickly pear (see <i>Opuntia</i> spp.). | | Quince (see <i>Cydonia oblonga</i>). | | |
| Privet (see <i>Ligustrum vulgare</i>). | | Quinine (see <i>Cinchona</i> spp.). | | |
| <i>Prosopis</i> spp. (mesquite, algaroba)..... | 148 | <i>Radicula armoracia</i> (horseradish)..... | 91, <u>138</u> | |
| <i>spicigera</i> | 148 | Radish (see <i>Raphanus sativus</i>). | | |
| Prune (see <i>Prunus</i> spp.). | | Rape (see <i>Brassica napus</i>). | | |
| <i>Prunus</i> spp..... | <u>172-180</u> | <i>Raphanus raphanistrum</i> (white charlock).... | 187 | |
| (cherry)..... | 17, | <i>sativus</i> (radish)..... | 19, <u>187</u> , 188 | |
| | 20, 21, 53, 109, 113, 129, 169, | Raspberry (see <i>Rubus</i> spp.). | | |
| | <u>172</u> , 173, 174, 175, 177, 179, 180 | Rattan (see <i>Calamus</i> spp.). | | |
| (plum)..... | 5, 17, 20, 21, | <i>Reseda</i> spp..... | 91 | |
| | 56, 105, 109, 111, 114, 166, 169, <u>172</u> , | <i>Rhamnus</i> spp. (buckthorn)..... | 48, 107, 108, 138 | |
| | 173, 174, 175, 176, 177, 178, 179, 190 | <i>alaternus</i> | 48 | |
| (prune)..... | <u>172</u> , 173 | <i>frangula</i> | 48 | |
| (sloe)..... | 17, 175 | <i>Rheum rhaponticum</i> (rhubarb)..... | 91, <u>189</u> | |
| <i>armeniaca</i> (apricot)..... | 5, | <i>Rhododendron</i> spp..... | 129 | |
| | 21, 24, 25, 114, 115, 166, 167, 172, 178, 179 | Rhubarb (see <i>Rheum rhaponticum</i>). | | |
| <i>avium</i> (sweet cherry)..... | 178 | <i>Ribes</i> spp..... | <u>118-121</u> | |
| <i>cerasus</i> (sour cherry)..... | 115, 178, 179, 180 | (currant)..... | 93, 118, 119, 120, 121 | |
| <i>chamæcerasus</i> (ground cherry)..... | 172 | (gooseberry)..... | 93, 118, 119, 120 | |
| <i>domestica</i> (plum)..... | 45, 172, 178, 179 | (red currant)..... | 121 | |
| <i>insititia</i> (damson plum)..... | 172, 178 | <i>alpinum</i> (Alpine currant)..... | 118 | |
| <i>laurocerasus</i> (cherry laurel)..... | 178 | <i>nigrum</i> (black currant, var. Baldwin).. | 118 | |
| <i>padus</i> (European bird cherry)..... | 172, 178 | B l a c k | | |
| <i>pseudocerasus</i> | 178 | Dutch).. <td> <td style="text-align: right;">118</td> </td> | <td style="text-align: right;">118</td> | 118 |
| <i>salicina</i> (Japanese plum)..... | 113, 180 | Black Na- | | |
| <i>spinosa</i> (blackthorn)..... | 172, 178, 179 | ples).... | 118 | |
| <i>Pseudotsuga</i> spp..... | 64 | Lee's Pro- | | |
| <i>mucronata</i> | 69 | lific).... | 118 | |
| <i>taxifolia</i> (Douglas fir)..... | 64, 65 | <i>rubrum</i> (red currant)..... | 118 | |
| <i>Psidium</i> spp. (guava)..... | 85, | <i>sanguineum</i> | 121 | |
| | 109, 112, 113, 114, 116, 117, 118, <u>131</u> , 132, 200 | | | |

	Page.		Page.
Rice (see <i>Oryza sativa</i>).....	189	<i>Shorea talura</i>	193, 194
<i>Ricinus</i> spp. (castor bean).....	85	Shrubs.....	105, 131, 172, 211
<i>Roripa nasturtium</i> (watercress).....	220	<i>Sideroxylon</i> (<i>Achras</i>) <i>australe</i> (black apple). .	114, 118
<i>Rosa</i> spp. (rose).....	5, 106, 107, 109, 113, 121, 127, 129, 150, 169, <u>191</u> , 192, 200	<i>sapota</i> (sapodilla). .	114, 115, <u>194</u>
(tea rose).....	151, 192	Silk cotton (see <i>Bombax malabaricum</i> ; <i>Ceiba</i> spp.).	
<i>arvensis</i>	191	rubber (see <i>Funtumia elastica</i>).	
<i>canina</i> (dog rose).....	191	Silky oak (see <i>Grevillea robusta</i>).	
<i>lævigata</i> (Cherokee rose).....	192	<i>Sinapis</i> spp. (mustard).....	92
Rose (see <i>Rosa</i> spp.).		Sissu (see <i>Dalbergia sissoo</i>).	
apple (see <i>Eugenia jambos</i>).		Sloe (see <i>Prunus</i> spp.).	
<i>Rothra tinctoria</i>	211	Solanaceæ.....	56, 92, 183, 217
Rowan tree (see <i>Sorbus</i> spp.).		<i>Solanum</i> spp.....	183
Rubber.....	192	<i>capsicastrum</i> (Jerusalem cherry)....	115
Assam (see <i>Ficus elastica</i>).		<i>melongena</i> (eggplant)....	86, 95, 122, 216, 217
Ceara (see <i>Manihot glaziovii</i>).		<i>tuberosum</i> (potato).....	5, 61, 135, <u>183-185</u> , 214, 217
India (see <i>Ficus elastica</i>).		<i>Solidago</i> spp. (goldenrod).....	104
Panama (see <i>Castilloa elastica</i>).		<i>Sorbus</i> spp. (mountain ash)....	20, 108, 138, 149, 177
Para rubber (see <i>Hevea brasiliensis</i>).		Sorghum (see <i>Holcus sorghum</i>).	
silk (see <i>Funtumia elastica</i>).		Sorrel (see <i>Rumex</i> spp.).	
<i>Rubus</i> spp.....	<u>47</u> , 121	Sour cherry (see <i>Prunus cerasus</i>).	
(blackberry).....	47, 188	Sour sop (see <i>Annona</i> spp.).	
(loganberry).....	47	Soy bean (see <i>Glycine hispida</i>).	
(raspberry).....	47, 61, 188, 197	Spelt (see <i>Triticum sativum</i>).	
<i>Rumex</i> spp. (sorrel).....	52, 135	Spinach (see <i>Spinacia oleracea</i>).	
Rutabaga (see <i>Brassica campestris</i>).		<i>Spinacia oleracea</i> (spinach).....	5, 42, <u>196</u>
Rye (see <i>Secale cereale</i>).		Spindle tree (see <i>Evonymus europæus</i>).	
<i>Saccharum officinarum</i> (sugar cane).....	5, 6, 34, 123, 160, 161, 189, 191, <u>197-208</u>	<i>Spondias</i> spp. (Para plum).....	113, <u>164</u>
Sago palm (see <i>Cycas revoluta</i>).		sp. (jobo amarillo).....	113
Sainfoin (see <i>Onobrychis sativa</i>).....	66	<i>mangifera</i> (?) (jobo de la India).....	113
Sal (see <i>Shorea</i> spp.).		Spruce (see <i>Picea</i> spp.).	
<i>Salacia reticulata</i>	56	Douglas (see <i>Pseudotsuga taxifolia</i>).	
<i>Salix</i> spp. (sallow).....	111	hemlock (see <i>Tsuga</i> spp.).	
(willow).....	6, 12, 107, 108, 111, 128, 138, 151, 180, <u>221-223</u>	Siberian (see <i>Picea</i> spp.).	
<i>alba</i> (white willow).....	222, 223	white (see <i>Picea alba</i>).	
<i>babylonica</i>	222	Squash (see <i>Cucurbita maxima</i>).	
<i>caprea</i> (goat willow).....	222, 223	Star apple (see <i>Chrysophyllum cainito</i>).	
<i>elegans</i>	222	<i>Sterculia acuminata</i> (kola).....	109, <u>140</u>
<i>fragilis</i> (brittle willow).....	222, 223	Straw.....	126
<i>purpurea</i> (purple osier).....	221, 222, 223	Strawberry (see <i>Fragaria</i> spp.).	
<i>triandra</i>	222, 223	Succory (see <i>Cichorium intybus</i>).	
<i>viminalis</i> (osier willow).....	221, 222	Sugar beet (see <i>Beta vulgaris crassa</i>).	
<i>viridis</i>	222	Sugar cane (see <i>Saccharum officinarum</i>).	
Sallow (see <i>Salix</i> spp.).		Sunflower (see <i>Helianthus</i> spp.).	
<i>Salsola</i> spp.....	41	Surinam cherry (see <i>Eugenia uniflora</i>).	
Sann hemp (see <i>Crotalaria</i>).		Sweet potato (see <i>Ipomœa batatas</i>).	
Sapodilla [see <i>Sideroxylon</i> (<i>Achras</i>) <i>sapota</i>].		<i>Swietenia mahajani</i> (mahogany).....	62, <u>142</u>
<i>Sarcocephalus esculentus</i>	116	Sycamore (see <i>Platanus</i> spp.).	
<i>Santalum album</i> (sandalwood).....	62	<i>Syringa</i> spp.....	27
<i>Schinus dependens</i>	56	Tamarack (see Conifers).	
<i>molle</i> (California pepper tree).....	56	Tamarind (see <i>Tamarindus indicus</i>).	
<i>Schizomeria ovata</i> (white ash).....	114	<i>Tamarindus indicus</i> (tamarind).....	210
<i>Secale cereale</i> (rye)....	<u>122</u> , 123, 124, 125, 126, 187, 193	Tamarisk (see <i>Tamarix</i> spp.).	
Sedges.....	203	<i>Tamarix</i> spp. (tamarisk).....	211
Senna bean.....	85	<i>gallica</i>	211
Service berry (see <i>Amelanchier</i> sp.).		<i>mannifera</i>	211
<i>Sesamia</i> spp.....	92	Tangerine (see <i>Citrus nobilis deliciosa</i>).	
<i>Setaria</i> spp.....	187	Tapioca (see <i>Manihot utilissima</i>).	
Shaddock (see <i>Citrus grandis</i>).		<i>Taraxacum officinale</i> (dandelion).....	135, 215
Shallot (see <i>Allium</i> spp.).		<i>Taxus</i> spp. (yew).....	223
She-oak (see <i>Casuarina</i> spp.).		Tea (see <i>Thea sinensis</i>).	
<i>Shorea</i> spp.....	193, 194	rose (see <i>Rosa</i> sp.).	
<i>robusta</i>	193, 194	Teak (see <i>Tectona grandis</i>).	
		<i>Tectona grandis</i> (teak).....	212

	Page.		Page.
<i>Terminalia</i> spp.	218	<i>Tulipa</i> spp. (tulip)	183
<i>bellerica</i>	218	Tuna (see <i>Opuntia</i> spp.)	185
<i>catappa</i> (winged kamani, tropical		Tur (see <i>Cajanus indicus</i>)	37
almond)	109, 115, 218	Turnip (see <i>Brassica rapa</i>)	
<i>chebula</i>	115, 218	<i>Ulmus</i> spp. (elm)	55,
<i>tomentosa</i>	218	95, 96, 105, 106, 107, 108, 127, 138, 176, 221	
<i>Thea sinensis</i> (tea)	59, 62, 162, 211, 212	sp. (cork elm)	96
<i>viridis</i>	212	<i>campestris</i> (English elm)	95, 96
<i>Theobroma</i> spp.	50, 55	<i>montana</i>	96
<i>cacao</i> (cacao)	50, 62,	Umbrella tree (see <i>Melia azedarach</i>)	
	85, 109, 115, 116, 195, 211	Mexican (see <i>Terminalia cat-</i>	
<i>Thevetia neriifolia</i>	115	<i>appa</i>)	
Thistle	41	<i>Vaccinium</i> spp. (whortleberry)	20
Thorns	111	<i>Vachellia farnesiana</i> (see <i>Acacia farnesiana</i>)	
Thorn, white	169	<i>Viburnum</i> spp.	5, 219
<i>Thuja</i> spp. (arborvitæ)	25	<i>Viburnum tinus</i>	219
<i>africana</i>	25	<i>Vicia</i> spp.	36
<i>occidentalis</i>	25	<i>faba</i> (broad bean)	35, 36
<i>Tilia</i> spp. (linden, lime, basswood)	105,	<i>sepum</i>	36
	107, 108, 138, 141, 142, 150, 176, 221	<i>Vigna unguiculata</i> (cowpeas)	36, 37, 38, 91
<i>cordata</i> (small-leaved linden)	141	Vines (see <i>Vitis</i> spp.)	
<i>europæa</i>	141	<i>Vitis</i> spp. (grape, vine)	5, 6, 15, 24, 109, 127-131,
<i>grandiflora</i>	141		150, 191
<i>parvifolia</i>	14, 141	<i>æstivalis</i> (bunch grape)	127
Timbers	15, 193, 213	<i>arizonica</i> (cañon grape)	127
Timothy (see <i>Phleum pratense</i>)		<i>carinthiaca</i>	127
Tobacco (see <i>Nicotiana tabacum</i>)		<i>vesuviana</i>	127
Tomato (see <i>Lycopersicum esculentum</i>)		<i>vinifera</i> (grape)	115, 127, 130, 131
Tonga beans	37	Walnut (see <i>Juglans</i> spp.)	
Toon (see <i>Cedrela toona</i>)		Watercress (see <i>Roripa nasturtium</i>)	
<i>Trifolium</i> spp. (clover)	6, 60, 61, 184, 214, 220	Watermelon (see <i>Citrullus citrullus</i>)	
<i>alexandrinum</i> (Egyptian clover,		Wattle, black (see <i>Acacia mollissima</i>)	
berseem)	44	Wheat (see <i>Triticum sativum</i>)	
<i>pratense</i>	165	White ash (see <i>Schizomeria ovata</i>)	
<i>Triticum</i> spp. (emmer)	122, 220	Whitethorn (see <i>Mespilus</i> spp.)	
<i>repens</i>	124	Whortleberry (<i>Vaccinium</i> spp.)	20
<i>sativum</i> (spelt)	122, 124, 220	Wild fruits	112, 116
<i>sativum</i> (wheat)	5,	Willow (see <i>Salix</i> spp.)	
	122, 123, 124, 125, 126, 187, 220	Yams	122
<i>Tropæolum</i> spp. (nasturtium)	215	Yew (see <i>Taxus</i> spp.)	
Tropical almond (see <i>Terminalia catappa</i>)		<i>Zea mays</i> (corn, maize)	6, 84,
<i>Tsuga</i> spp. (hemlock)	64, 135		85, 122, 123, 135, 142, 189, 197, 200, 203, 208, 214

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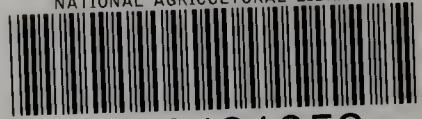
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